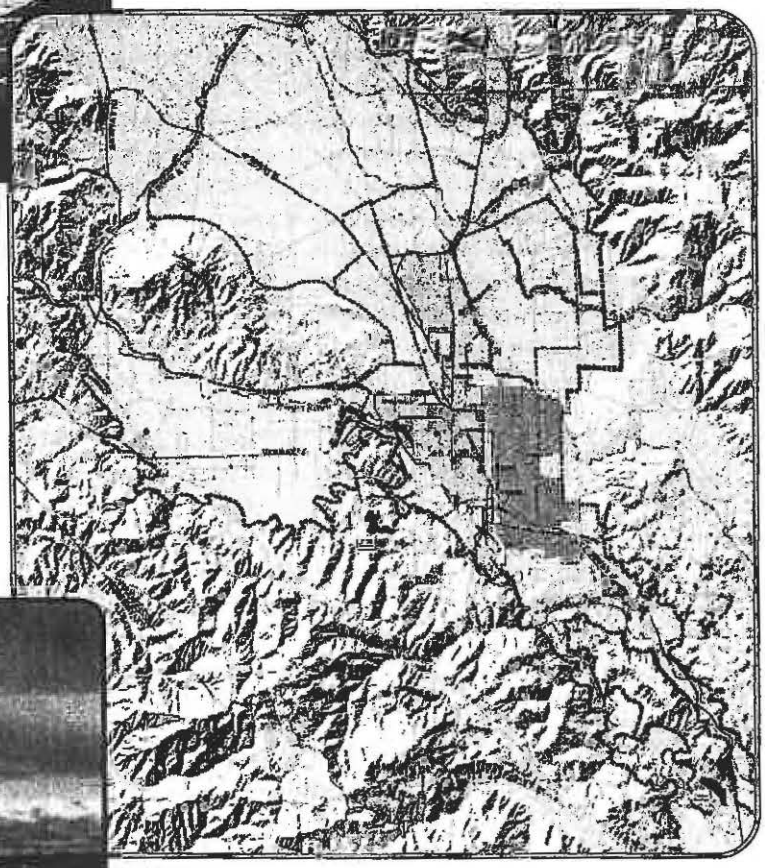
Revised Administrative
Final Report

Groundwater Management Plan Update for the San Benito County Part of the Gilroy-Hollister Groundwater Basin



Water Resources Association of San Benito County

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Section 1: Introduction

The Groundwater Management Plan for the San Benito County Part of the Gilroy-Hollister Groundwater Basin (1998 GMP) was prepared in 1998 for a consortium of agencies including the Aromas Water District, the City of Hollister, the City of San Juan Bautista, San Benito County Water District, Sunnyslope County Water District, and Tres Pinos County Water District.

Since the preparation of the 1998 GMP, the Water Resources Association of San Benito County (WRA) was formed by the City of Hollister, the City of San Juan Bautista, San Benito County Water District (SBCWD), and the Sunnyslope County Water District. This plan is intended to be an update to the 1998 GMP. Alternatives for groundwater management were developed for this update of the 1998 GMP in the Draft Report Evaluation of Project Alternatives to Implement Groundwater Management Plan in San Benito County (June 2002 Draft Report). The July 2002 Draft Report was preceded by an earlier effort in 2001 by EDAW and Todd Engineers documenting existing conditions and the end-points of the range of groundwater management options (2001 existing condition). Detailed information regarding hydrogeology, water quality and water levels are found in the 1998 GMP and the Annual Groundwater Reports prepared by the SBCWD.

1.1 Purpose

The following problem statements regarding the quantity and quality of water in San Benito County are addressed in this Groundwater Management Plan Update (GMP Update):

Water Quantity

- Existing imbalance of areas of high and low groundwater
- Pending imbalance of supply and demand due to planned growth
- Existing and pending inability to adequately dispose of wastewater
- Frequent reduction of long-term imported water supplies and lower quality local supplies

Water Quality

- Increasing total dissolved solids (TDS) – salts are accumulating in the basin and constrain beneficial uses
- Hardness affects urban supplies and leads to water softeners that further add salts to the basin
- Nitrates have accumulated in some groundwater sub-basins, affecting beneficial uses
- Effective water quality protection is lacking

The purpose of this GMP Update is to build on the previous work in the further identification and evaluation of alternatives that will define coordinated basin-wide approaches to groundwater

management and serve as the basis for the upcoming Program Environmental Impact Report (PEIR).

1.2 Approach

Keeping in mind these problems in the Gilroy-Hollister portion of the San Benito County groundwater basin, the approach that has been taken in this report is to:

- Further develop objectives and criteria by which alternatives will be evaluated.
- Further develop the toolbox of project elements identified in the 2001 Phase 1 Existing Conditions effort.
- Use the toolbox of project elements to develop additional alternatives that bridge the 100% Local Supply and 100% Imported Supply alternatives developed in the 2001 Phase 1 Existing conditions effort.
- Evaluate the alternatives against the objectives and criteria that were developed.
- Estimate water supplies and water demands for present and future conditions for municipal/industrial and agricultural uses using existing analyses
- Using estimated water needs, identify potential projects that could be used to manage the groundwater basin in accordance with the identified alternatives.
- Prioritize and phase projects for implementation and develop planning-level estimates of the probable cost of construction for the projects.
- As part of the preparation of PEIR, identify mitigation measures for these projects that may cause or result in impacts through use or construction to air quality, biological resources, cultural resources, energy, geology or seismicity, hydrology and water quality, land-use, noise or visual and aesthetic resources.

Section 2: Condition of the Basin

2.1 Summary

The SBCWD has jurisdiction throughout San Benito County to support surface water management and groundwater replenishment activities as well as collecting and evaluating data related to water management. The SBCWD annually prepares a Groundwater Report that documents and evaluates surface water and groundwater use for the previous water year.

SBCWD operates and maintains facilities to import, distribute, and recharge surface water from the CVP's San Felipe Project (San Felipe) into the groundwater basin as well as to impound and percolate water from the Hernandez and Paicines Reservoirs. SBCWD has formed three zones of benefit to generate the necessary funds for the facilities:

- Zone 1 covers the entire county and provides the funding base for certain District administrative expenses.
- Zone 3, which covers the San Benito River Valley from the Willow Creek School gauging station to San Juan Bautista and Tres Pinos Creek Valley from Paicines to the San Benito River, provides the funding base for operation of Hernandez and Paicines Reservoirs and related percolation activities.
- Zone 6 includes the Pacheco, Bolsa Southeast, San Juan, Hollister West, Hollister East, and Tres Pinos groundwater sub-basins and provides the funding base for importation and distribution of San Felipe water. Zone 6 covers approximately 48,000 acres.

The groundwater sub-basin boundaries are shown on Figure 2-1. The physical characteristics have been detailed in many previous reports, and recent sub-basin water balance and water quality issues are summarized in this document.

As discussed in the 1998 GMP and other previous reports, prior to the introduction of imported San Felipe water, more groundwater was being extracted from the basin than was being recharged, resulting in overdraft over the long term. Since the first deliveries of imported San Felipe Water in 1987, most areas of the groundwater basin became full in as few as 4 to 5 years, and many sub-basins experience localized areas of high groundwater. Reductions and increases of water in storage within groundwater sub-basins occur annually, concurrent with hydrologic variability and each sub-basin's management practices. Overdraft could occur in a sub-basin if a net decrease in water levels takes place over the long term, as occurred prior to the delivery of San Felipe Water. Evaluation of overdraft within each sub-basin is beyond the scope of this report.

It has been estimated that the basin's groundwater storage capacity is approximately 500,000 AF within the first 200 feet of the ground surface. The basin's approximate average annual safe groundwater yield is estimated to be between 40,000 to 50,000 AF/yr (1998 GMP); for the purposes of this analysis, the yield is estimated at 54,000 AF. (J. Gregg, personal communication).

Sub-basin Conditions

More detailed information regarding individual sub-basins is found in the 1998 GMP and the Annual Groundwater Reports. The information below is a summary of current conditions for each sub-basin and is derived from information in the Water Year 2001 Annual Groundwater Report.

2.2.1 San Juan

High groundwater level is characteristic of the San Juan sub-basin. As imported CVP water was introduced and used in this sub-basin, percolation continued from applied water, and well pumping was insufficient to keep groundwater levels from rising. Soil structure in the sub-basin is another factor influencing groundwater level. Clay layers, existing at 3 to 12 feet below the ground surface in some areas, result in poor soil drainage. As a result, perched high groundwater saturated the root zone in some locations.

According to the Water Year 2001 Annual Groundwater Report, the San Juan sub-basin showed stable groundwater storage levels in the recent past. This appears to be the result of normal or below-normal rainfall and streamflow and the suspension of percolation of Zone 3 and Zone 6 water in the Hollister West and San Juan sub-basins. A review of the water balance indicates that land uses overlying the San Juan sub-basin are predominantly agricultural, with water supplies provided by both groundwater and imported surface water, depending on the location.

The groundwater quality in the San Juan sub-basin typically has an average TDS concentration of 1,200 parts per million (ppm), among the highest within the San Benito County groundwater basin.

2.2.2 Hollister West

A review of groundwater levels in the Hollister West sub-basin indicates that localized high groundwater levels occur adjacent to areas of the San Benito River. The SBCWD has discharged less surface water for percolation over the past 2 years to manage the high water levels. The water balance for the Hollister West sub-basin indicates a 1,300 AF reduction of water in storage in Water Year 2001, even though 2001 was considered a normal rainfall year. Inspection of the groundwater hydrograph over the last 2 years seems to confirm a gradual decline in groundwater levels, which are being monitored as part of the SBCWD's annual groundwater report. Land uses overlying the Hollister West sub-basin are predominantly M&I.

The 3 million gallons per day (MGD) Lessalt surface water treatment plant completed in November 2002 will reduce groundwater pumping between an estimated 2,300 –2,800 AF/yr for some of the M&I uses in the City of Hollister and Sunnyslope County Water District service areas. The Lessalt plant is expected to result in a net increase in in-lieu banking, which should moderate the overdraft previously experienced.

The groundwater in the Hollister West sub-basin has an average TDS concentration of 800 ppm and a hardness in excess of 400 ppm. The Lessalt plant should reduce the use of brine

softeners used by many water customers to reduce the mineral hardness of the groundwater. Brine softeners contribute salt to the wastewater stream during regeneration of the ion exchange membranes.

2.2.3 Hollister East

Hollister East is generally considered to be a "full" sub-basin. The hydrographs for the sub-basin indicate that its groundwater level is generally increasing over time. Although the amount of imported San Felipe surface water percolation was reduced in 2001 by changing water system management measures, groundwater in storage still increased by 3,000 AF. This sub-basin experiences high agricultural water use in rural areas and high M&I use in the urban areas.

The average concentration of TDS for the Hollister East sub-basin groundwater is approximately the same as the Hollister West sub-basin groundwater. Similar to Hollister West, the groundwater in this area also contains high mineral hardness. As a result, urban water customers use water softeners extensively. In addition to TDS and hardness in Hollister East, boron can be found in the 2 to 3 ppm range. For agricultural purposes, boron levels of less than 0.5 ppm are desirable.

2.2.4 Bolsa

Groundwater levels vary throughout the Bolsa sub-basin. High groundwater levels are present in the northeast, and an area of low groundwater exists in the south. During Water Year 2001, the water balance showed a net loss of water in storage of 2,000 AF/yr. The Bolsa sub-basin has experienced consistent reductions of water in storage, indicating that it is in overdraft. The Bolsa area is predominantly agricultural and does not receive imported surface water.

The average boron concentration in the Bolsa sub-basin is 2-3 ppm, with accompanying issues the same as those in the Hollister East sub-basin. The average TDS concentration is approximately 800 ppm.

2.2.5 Pacheco

In the Pacheco sub-basin, groundwater levels were stable for 2 years before Water Year 2001. Then in 2001, the water balance showed a slight increase of 400 AF per year of groundwater in storage. It appears that the Pacheco sub-basin has significant potential for groundwater banking. Similar to the Hollister East area, the SBCWD instituted water level management measures, and San Felipe water percolation was reduced.

TDS concentrations for the Pacheco sub-basin are on the order of 600 ppm, which is lower than the other sub-basins. This groundwater quality is adequate to support the mainly agricultural water usage in the Pacheco area.

2.2.6 Bolsa Southeast

Groundwater storage in the Bolsa Southeast sub-basin increased by 250 AF in 2001. Inspection of the hydrograph of average groundwater levels in this sub-basin indicates that they are rising due to the delivery of imported surface water. Based on a groundwater modeling

analyses, groundwater levels are starting to rise in the groundwater depression identified in the report *Groundwater Management Plan: Existing Conditions and Alternatives* (December, 2001).

2.2.7 Tres Pinos

In Water Year 2001, the Tres Pinos sub-basin water storage increased by an estimated 150 AF. Analysis of this sub-basin shows that the groundwater level is slightly higher than in the other sub-basins and that there are localized areas of even higher groundwater near the San Benito River. There may be some opportunities for groundwater banking in this sub-basin in areas away from the San Benito River.

2.3 Groundwater Monitoring Programs

The SBCWD has taken and maintained data related to groundwater levels and surface water flow measurements since the early 1920's for the San Benito County Portion of the Gilroy-Hollister Groundwater Basin and its principle tributaries, Pacheco Creek, Tres Pinos Creek and the San Benito River.

The early data was instrumental in supporting U.S. Geological Survey (USGS) and U.S. Bureau of Reclamation (USBR) studies which led to design and construction of the Hernandez Dam and Reservoir together with the necessary water rights for Hernandez and Paicines reservoirs and the eventual development of the San Felipe Project. The SBCWD has continued that early monitoring by measuring groundwater levels from a network of 80 to 100 wells. Levels have been measured on a semi-annual basis since 1976 and on a quarterly basis since 1991/92. The SBCWD has a cooperative agreement with the USGS for water measurement at a gauging station on Tres Pinos Creek and two gauging stations on the San Benito River. In addition, SBCWD personnel, and USGS personnel on a special study basis, conduct periodic surface water flow measurements to determine stream flows along the San Benito River and Tres Pinos Creek.

Since the 1991/92 time period the SBCWD has measured groundwater extraction at major wells (with discharge pipes) three (3) inches in diameter or greater and has assessed groundwater extraction from minor wells through a system of annual groundwater extraction reports. Groundwater extraction at major wells is measured directly or calculated semiannually by metering the number of hours of pump operation and multiplying by the average discharge rate. The pump discharge rate is measured and periodically updated using a velocity measurement device inserted into the discharge pipeline. Discharges from the San Felipe Distribution System for percolation in area streams are all directly metered.

Historically, there has not been systematic monitoring of groundwater quality in the basin. However, in 1997, the SBCWD initiated a Groundwater Monitoring Program. That program began with the measurement of nitrate concentrations and electrical conductivity at major irrigation wells and has expanded to include quarterly sampling for mineral content and inorganic chemicals from a network of 18 wells.

Potable water systems under the jurisdiction of the California Department of Health Services and/or the Department of Environmental Health Services of San Benito County must monitor and report certain water quality parameters to fulfill regulatory requirements.

The SBCWD seeks to expand and improve its Groundwater Quality Monitoring System for the basin, and has been awarded a $200,000 grant from the California Department of Water Resources (DWR) toward the development of a Basin Wide Groundwater Quality Monitoring Program. This program will include measurement of water quality directly, the collection of water quality data gathered by other agencies, and a system for data maintenance and presentation. The time schedule for the development of a basin wide Groundwater Quality Monitoring Program is fourteen months, beginning on November 1, 2002.

The SBCWD is systematically improving its groundwater and surface water measurement and water quality monitoring efforts and recently completed the installation of shallow groundwater monitoring wells in the San Juan and Hollister West sub basins.

The results of the SBCWD's water monitoring activities are presented and summarized in the Annual Groundwater Reports prepared by the SBCWD for the San Benito County Portion of Gilroy-Hollister Groundwater Basin and the Tres Pinos and Paicines Groundwater Basins.

Section 3: Current and Estimated Future Water Supplies and Demands

In order to estimate the order-of-magnitude size of future water management facilities, it is necessary to estimate demands and supplies. These demands and supply estimates are based on information provided in previous reports as well as by the SBCWD.

3.1 Water Supplies and Infrastructure

The majority of the information used to estimate water supplies potentially available to the County was derived from the Annual Groundwater Reports prepared by the San Benito County Water District. Additional information used to augment these reports is identified in the text below.

3.1.1 Water Year Classifications

The analysis of available water sources in this section required classification of water years into wet, normal, dry, and critically dry years. Long-term annual precipitation data from 1875 to 2001 for gages at Hollister and the SBCWD offices were evaluated to classify water year types based on deviations from average annual precipitation. Reliable groundwater water balance data were limited to water balances estimated from 1997 to the present. The review of average annual precipitation from water year 1997 through water year 2001 indicated that 1998 could be classified as a wet year, and 2001 could be classified as normal.

No dry or critically dry water years occurred in the 1997-2001 water year time period; therefore, estimates were calculated as described below. All supply values are shown in Table 3-2: Estimated Supply Availability. The supply components are further described in the following Sections 3.1.2 and 3.1.3. The water year classifications are used in developing the 20-year supply demand simulation in Section 3.3.

3.1.1.1 Wet Year

Supply values for the wet year summarized in Table 3-2 are taken from Table 9 of the Annual Groundwater Report for Water Year 1998. Although the value of 450 AF of Local Surface Water (Paicines and Hernandes percolation) appears low when compared to the value for a normal year (Water Year 2001), it is considered sufficient for the purposes of developing the illustrative example in Section 3.3.

3.1.1.2 Normal Year

Supply values for the normal year summarized in Table 3-2 are taken from Table 9 of the Annual Groundwater Report for Water Year 2001. The total local supply minus the Other Local Surface Supplies and Cienega is approximately 54,000 AF/yr which is consistent with the value for the average annual yield of the groundwater basin (J. Gregg, Personal Communication, July 2002).

3.1.1.3 Dry Year and Critically Dry Year

Because no reliable water balances were available using the methods used in water year 1998 and water year 2001 to estimate dry year and critically dry year supplies, it was assumed that all values, with the exception of deep percolation and recycled water, would be considerably less than normal years and were adjusted based on direction from SBCWD staff.

3.1.2 Local Supplies

Using Table 9 from the Annual Groundwater Reports, natural supplies from rainfall and stream percolation were calculated separately for Zone 6 only and the Bolsa, Paicines, and Tres Pinos Creek Valley by summing the components of: (1) total stream percolation from natural streamflow, (2) San Felipe releases, and (3) total deep percolation through the soils from rainfall for each area.

Local surface water supply represents stream percolation from Hernandez and Paicines releases summed with values for: (1) Zone 6 only and (2) the combined Bolsa, Paicines, and Tres Pinos Creek Valley area. Although there may be inconsistencies in local surface water values (Paicines and Hernandez percolation) between the 1998 and 2001 water years, the estimate of water sources remains valid for the purposes of developing the illustrative example in Section 3.3.

Potentially available water supplies from Pacheco Creek, Arroyo de Las Viboras and Arroyo dos Picachos were estimated using stream gauging data when available and otherwise using streamflow predictions prepared for the San Benito County Water District as part of the water balance analysis for the Annual Groundwater Reports. Gauged and predicted daily streamflow data were available for the 3 creeks from Water Year 1984 to Water Year 2001. Based on measured and predicted streamflow data, the estimated quantities of water that could be available are summarized below. These figures need to be corroborated with additional field measurements.

Table 3-1: Summary of Gauged/Predicted Streamflow from WY 1984 – WY 2001

	Pacheco Creek (AF/yr)	Arroyo de Las Viboras (AF/yr)	Arroyo dos Picachos (AF/yr)	Total (AF/yr)
Average	25,550	3,160	2,100	30,810
Minimum	800	150	100	1,050
Maximum	92,900	11,580	7,720	112,200

There are some existing water rights for the SBCWD and other rights holders for the Pacheco Creek, Arroyo de Las Viboras and Arroyo dos Picachos, therefore the availability of streamflows for diversion will be less than the predicted flows. A more detailed discussion of water rights occurs later in Section 5.5.

Cienega groundwater is another local supply that could be available the supply pipeline is repaired. The City of Hollister has a water rights decision for up to 489.41 AF/yr with a maximum of up to 40.78 AF/month. It is assumed that the maximum 489.41 AF/yr is available during wet

and most normal years but will be reduced during dry and critically dry years, as shown in Table 3-2.

The values in Table 3-2 for deep percolation of domestic/irrigation water are derived from Table 9 of the Annual Groundwater Reports and are for: (1) Zone 6 only, and (2) the combined Bolsa, Paicines, and Tres Pinos Creek Valley area.

The groundwater inflow value in Table 3-2 is extracted from Table 9 of the Annual Groundwater Reports. This value represents the total groundwater inflow for (1) Zone 6 only and (2) the combined Bolsa, Paicines, and Tres Pinos Creek Valley area.

The recycled water supply estimates shown in Table 3-2 are derived from the recycled water estimate in Table 9 of the Annual Groundwater Report. Where recycled water estimates were not available, a base-line estimate of 3,000 AF/yr was used. It should be noted that the recycled water supply is a function of population, and that additional recycled water will be available in the future. The recycled water could be percolated and indirectly reused, or, in the future, could be directly reused for irrigation of parks and golf courses.

3.1.3 Imported San Felipe Water

As shown in Table 3-2, both M&I and agricultural imported water supply estimates are based on recent evaluations of U.S. Bureau of Reclamation CVP contract entitlements compared to actual deliveries. The San Benito County imported San Felipe Water contract is for a total supply of 8,250 AF/yr for M&I supply and 35,550 AF/yr for agriculture. However, recent actions have resulted in reallocation of CVP supplies for legal and institutional purposes, such as meeting Bay-Delta Standards, minimum instream flows and those required under the CVP Improvement Act (CVPIA), and they have effectively reduced CVP contract allocations.

It is estimated that full contract entitlements will be delivered only in a "wet" year, as defined by rainfall and runoff in the Central Valley for the CVP. Even in "normal" years, CVP deliveries are only expected to be 85% of M&I contract entitlements and 65% of agricultural contract entitlements. In "dry" and "critically dry" years, the deliveries are expected to be less. In "dry" years, CVP M&I deliveries are expected to be 75% of contract entitlements and 50% of agricultural contract entitlements. In "critically dry" years, CVP M&I deliveries are expected to be 35% of contract entitlements and 0% of agricultural contract entitlements. The resulting quantities of expected imported water deliveries are shown in Table 3-2.

3.1.4 Summary of Potential Water Supply Availability

Table 3-2 summarizes the various sources of water supply that could be available to San Benito County.

Table 3-2: Potential Supply Availability in Wet, Normal, Dry, and Critically Dry Years (AF)

	Wet Year (WY 1998)	Normal Year (WY 2001)	Estimated Dry Year	Estimated Critically Dry Year
Local Supplies				
Zone 6: Natural from Rainfall, Stream Percolation, and San Felipe Releases	36,685 (1)	15,444 (1)	10,000	0
Bolsa, Paicines, Tres Pinos Natural from Rainfall and Stream Percolation	11,536 (1)	4,791 (1)	4,000	0
Local Surface Water (Paicines and Hernandes Percolation)	450 (1)	6,917 (1)	350	0
Deep Percolation of Domestic/Irrigation Water in Zone 6, Bolsa, Paicines and Tres Pinos	9,438 (1)	10,403 (1)	10,400	10,400
Groundwater Influent Flow	10,000 (1)	12,500 (1)	7,000	5,000
Recycled Water Recharge/Reuse	3,557 (1)	3,338 (1)	3,000	3,000
Other Local Surface Water(2)	112,200	30,810	1,050	0
Cienega Groundwater(3)	489	489	350	200
Total Local Supplies	**184,355**	**84,692**	**36,150**	**18,600**
Imported Surface Water Availability				
Imported M&I (% of Contract Entitlement)	8,250 (100%)	7,012 (85%)	6,188 (75%)	2,888 (35%)
Imported Ag (% of Contract Entitlement)	35,550 (100%)	23,108 (65%)	17,775 (50%)	0
Total Imported Surface Water	**43,800**	**30,120**	**23,963**	**2,888**
Combined Total				
Total Potential Local and Imported Supplies	228,155	114,812	60,113	21,488

(1) Estimates are based on Table 9 – Groundwater Balances from Annual Groundwater Reports for Water Year 1998 and Water Year 2001.

(2) Estimates are based on gauged/predicted stream flows for Pacheco Creek, Arroyo de Las Viboras, and Arroyo dos Picachos and will not be available until diversion facilities are constructed and water rights are resolved. Dry Years are assumed to have minimum flow, critically dry areas are assumed to have zero flow while wet and normal years correspond to maximum and average flows respectively.

(3) Cienega availability is contingent on construction/repair of the pipeline.

3.1.5 Water Delivery Infrastructure

A detailed discussion of existing water delivery infrastructure can be found in the 1998 Groundwater Management Plan Report and the Annual Groundwater Reports.

3.2 Current and Future Demand Projection

Future water demand projections for both M&I and agricultural uses were developed as described below. First, available information on past water usage was used to estimate demands for current conditions. Future M&I demand was estimated based on the Growth Management Ordinances currently in place in the cities and county. These ordinances are discussed in detail below. Future agricultural demand was estimated by SBCWD staff, and a report prepared for the District on Zone 6 irrigation.

3.2.1 Past Water Usage

Table 3-3 contains information regarding water usage in the past. The data summarize information contained in the Annual Groundwater Reports prepared by the SBCWD.

Table 3-3: Water Use in Hollister Groundwater Basin-Water Years 1991 - 2001

Water Year	Agricultural Imported SW Use [c](AF/year)	M&I Imported SW Use [c] (AF/year)	Sub-total SW Use (AF/year)	Agricultural GW Use (AF/year)	M&I GW Use (AF/year)	Sub-total GW Use (AF/year)	Total SW + GW Use (AF/year)	Annual Rainfall (in)[e]
1991[a]	SW not available	SW not available	SW not available	46,640	7,631	54,271	54,271	10.94
1992[a]	SW not available	SW not available	SW not available	32,210	6,912	39,122	39,122	12.31
1993[a]	SW not available	SW not available	SW not available	38,878	5,066	43,944	43,944	18.29
1994[a]	SW not available	SW not available	SW not available	41,854	7,186	49,040	49,040	10.5
1995[a]	SW not available	SW not available	SW not available	36,744	5,895	42,639	42,639	22.42
1996[b]	18,325 52%	759 9%	19,084 44%	42,523	7,415	49,938	69,022	15.46
1997[b]	21,061 59%	838 10%	21,899 50%	40,569	10,277	50,846	72,745	15.47
1998[b]	12,335 35%	459 6%	12,794 29%	28,843	8,191	37,034	49,828	28.61
1999[b]	17,343 49%	695 8%	18,038 41%	38,717	9,415	48,132	66,170	10.61
2000[b]	17,656 50%	1,017 12%	18,673 43%	37,263	9,794	47,057	65,730	11.44
2001[b]	18,281 51%	1,254 15%	19,535 45%	33,715	9,433	43,148	62,683	14.09
Average[d]	17,500 49%	837 10%	18,337 42%	37,996	7,929	45,925	55,927	15.47
Maximum[d]	21,061 50%	1,254 15%	21,899 50%	46,640	10,277	54,271	72,745	28.61
Minimum[d]	12,335 35%	459 6%	12,794 29%	28,843	5,066	37,034	39,122	10.5

(a) Data were extracted from Water Year 1995 Annual Groundwater Report
(b) Data were extracted from the Annual Groundwater Reports for the Water Year reported
(c) 100% CVP Contract Entitlement for Agricultural Uses is 35,550 AF/yr, 100% CVP Contract Entitlement for M&I Uses is 8,250 AF/yr for a total of 43,800 AF/yr. M&I Entitlement has not been fully exercised.
(d) Average, Maximum, and Minimum of all surface water data for 1996 – 2001 and groundwater and precipitation for 1991 – 2001
(e) Hollister Station

3.2.2 M&I – Current and Future Demands

3.2.2.1 Estimated 2002 Demands

Information regarding 2002 M&I water demand for the incorporated cities of Hollister and San Juan Bautista and the unincorporated portions of the County were estimated as follows. Sunnyslope CWD serves customers in both the City of Hollister and in unincorporated San Benito County. Approximately 60% of Sunnyslope CWD's customers are in the City of Hollister; the remaining 40% are in unincorporated San Benito County.

However, because the California Department of Finance's information, which was used for developing the residential portion of the demand estimate, does not specifically subdivide Sunnyslope CWD's population between the incorporated and unincorporated portions of the County, it was assumed that Sunnyslope County Water District customers would fall under the City of Hollister, and that San Benito County Water District customers would be considered to be located in unincorporated areas. This assumption has limited impact on the total demands estimated and is considered valid for this estimate.

The 2002 demands were based on the Department of Finance population and persons per dwelling unit information for January 1, 2002. Population was divided by persons per dwelling unit to estimate the number of dwelling units. The number of dwelling units were then multiplied by an average demand of 420 gallons per day per dwelling unit which is consistent with the demands estimated for a relatively new residential development west of Fairview Road (Northeast Fairview Specific Plan draft EIR, April 1998).

The estimated demands were consistent with those in the 1999 Urban Water Management Plan (UWMP), Table 1-15, Hollister Urban Area – Projected Population and Water Demands With Implementation of Conservation Program and the City of San Juan Bautista General Plan, P. III-J.4.

Based on these sources, the total residential water demand for 2002 is 5,108 AF/year in urban areas and 2,789 AF/year in the unincorporated County. Non-residential demand of 2,790 AF/year for schools, parks, golf courses, industry, etc. was estimated by subtracting the residential demand of 5,108 AF/yr and 2,789 AF/yr from the total Domestic and Municipal water use of 10,687 AF for Water Year 2001 (Annual Groundwater Report, Table 1).

3.2.2.2 Estimated 2022 Demands

The following method was used to evaluate the effects on water demand of the Growth Management Ordinances in the Cities of Hollister and San Juan Bautista and the unincorporated portions of San Benito County.

- California Department of Finance (CDOF) population estimates for 2002 were used as the current condition and as the base for estimating future populations for the urban and unincorporated portions of the County.

- Estimated future water demand for the existing population was based on the assumption that for the 20 years from 2002 to 2022, conservation measures will result in a 1% annual decrease in water demand from each existing residential dwelling unit. Demand is expected to decrease from 420 gpd/du in 2002 to 344 gpd/du in 2022 for this sector of the urban service areas.

- Population increases in the City of Hollister/Sunnyslope County Water District were based on Ordinance 959, which limits growth to 244 residential units per year. An assumed density of 3.537 persons per household was used, based on CDOF estimates for City of Hollister for 1 January 2002.

- Population increases in the City of San Juan Bautista were based on the current ordinance that limits growth to 1% per year as set by the City of San Juan Bautista City Council in August 2002. An assumed density of 2.739 persons per household was used, based on CDOF estimates for City of San Juan Bautista for 1 January 2002.

- Population increases in the unincorporated County areas were based on Ordinance 751, which limits population increases to 1% per year. An assumed density of 3.034 persons per household was used, based on CDOF estimates for unincorporated San Benito County for 1 January 2002.

- Water demand associated with new growth is assumed to be 312 gpd/du which is consistent with the estimates used in the West of Fairview Water Supply Assessment. This assumes an interior demand of 230 gpd/du and exterior demand on a single family home of 92 gpd/du.

M&I demands and population are summarized in Table 3-4: Estimated Population and M&I and Agricultural Demands 2002-2022.

The estimated total residential demand for 2022 is estimated to be 8,675 AF/yr. The non-residential demand was assumed to continue to be 2;790 AF/yr since there is insufficient information available to predict future non-residential demands. The total M&I Demand is 11,465 AF/yr and is the sum of the residential and non-residential demands as shown in Table 3-4.

3.2.3 Agricultural – Current and Future Demands

The estimated total agricultural demand for 2002 is derived from the Annual Groundwater Report WY2001, Table 9, work done for the SBCWD by Ken Henneman, and from SBCWD staff. The 2001 Annual Groundwater Report estimated agricultural demand for 2000 to be 51,996 AF/yr. The GWPM update estimates that by the year 2022, up to 17,000 additional acres of land in the project area could be converted to irrigated agriculture. Currently, grazing land (annual grassland) and unirrigated hay fields with good soil characteristics are being converted to irrigated row crops and, to a lesser extent, orchards. This trend is likely to continue to occur in the future and is independent of implication of any of the groundwater management project elements in the proposed GWMP Update.

These agricultural demands assume an increase from 36,000 irrigable acres in 2002 to about 53,000 irrigable acres in 2022. They are also based on the assumption of 1.8 feet/year water duty, 0.4 feet of effective precipitation (ep) and 85% irrigation efficiency. The estimated 85% agricultural irrigation efficiency is consistent with the CVP guidelines for its water supply contractors. The increase in agricultural irrigation is based on estimates of available acreage not currently irrigated that could be irrigated in the future.

25-year agricultural demand estimates were calculated assuming an evenly-distributed linear increase from a 2000 demand of 51,996 AF/yr to a 2025 demand of 78,000 AF/yr. The total agricultural demand is estimated at 66,000 AF/yr for 2002 and 74,880 AF/yr for 2022.

3.2.4 Other Demands

All other estimated water demands are taken and adjusted from Henneman (2000). These water demands include conveyance losses and other minor uses. For 2002 through 2022, this estimated demand is expected to remain at 3,000 AF/yr.

3.2.5 Summary of 2002 – 2022 M&I and Agricultural Demands

Table 3-4 summarizes the estimated 2002 and 2022 populations and water demand estimates. It should be noted that the agricultural demands far outweigh the M&I demands and changes in assumptions for in agricultural demands can greatly influence the water supply that is needed to meet future demands.

Table 3-4: Estimated Population and M&I and Agricultural Demands 2002-2022

	Demands 2002 (AF/yr)[a]	Population 2002[b]	Estimated Demands 2022 (AF/yr)[c]	Estimated Population 2022[d]
Municipal & Industrial				
City of Hollister	4,834	36,338	5,665	53,600
City of San Juan Bautista	274	1,597	270	1,949
Total M&I Urban Areas	5,108	37,935	5,934	55,549
Other Unincorporated County	2,789	17,986	2,741	21,946
Non-Residential Demand	2,790		2,790	
Total Municipal and Industrial Demands/Population	10,687	55,921	11,465	77,495
Agricultural				
Zone 6, Bolsa, Paicines and Tres Pinos Creek Valley	Estimate based on acres under irrigation		Estimate based on all irrigable acres	
Total Agricultural Demands	54,076		74,880	
Other				
Other Demands	3,000		3,000	
Total				
Total Municipal and Industrial and Agricultural	67,763		89,345	

(a) 2002 Estimated Demands were based on the assumption that the demand per dwelling unit is 420 gallons per day per dwelling unit. The number of persons per dwelling unit was adopted from California Department of Finance Table 1: County and State Population and Housing Estimate, Official State Estimates as of January 1, 2002 for San Benito County.

(b) Population data for 2002 were adopted from California Department of Finance Table 2: City and County Population and Housing Estimates, Official State Estimates as of January 1, 2002.

(c) Estimated Demands for 2022 are based on Estimated Demand for existing population and Estimated Demand for new growth. Further details are in the report.

(d) Estimated Population for 2022 are based on current Growth Management Ordinances and are described in the report.

3.3 Reliability and Sustainability

As discussed in the 1998 Groundwater Management Plan, the inherent variability of hydrologic cycles and the potential changes in regulation can reduce the reliability and hence the availability of many water supplies. However, through managed development and careful use of all of the potential supplies, the dry period demands should be able to be met reliably.

The sustainability of the local supplies needs to also be considered such that environmental needs are met in surface waterways, groundwater levels are managed to minimize groundwater overdraft, and high groundwater is lowered to acceptable levels. Diversity in supply through the development and prudent use of both local and imported water supplies provides both reliability and sustainability.

The following section describes the manner in which various supplies can be managed and used conjunctively to provide both a reliable and sustainable supply for San Benito County.

3.3.1 20-year Simulation of Groundwater Basin Operation

Using the demand estimates from Growth Management assumptions and water source availability estimates assembled above, an illustrative 20-year simulation of groundwater basin operation was prepared. By carefully using the range of supply sources available and the projected demands, a 3-year dry period can be bridged by using groundwater banking.

For the purposes of this illustrative example, a 3-year dry period was assumed to be sufficient, although dry periods can obviously extend beyond 3 years. A 3-year dry period is consistent with the multiple-dry-year analyses prepared for the Hollister area Urban Water Management Plan.

A 20-year period was selected for the illustrative example because it is the projected planning horizon for this groundwater management plan and 20-years will contain many normal, wet; dry, and critically dry years to illustrate groundwater banking operations. For the purposes of the simulation, the 20 years included 8 normal years, 6 wet years, 4 dry years, and 2 critically dry years. The distribution of types of years was randomly selected within the 20-year period, and the dry-critically dry years were placed in sequence.

Using the assumptions for M&I, agricultural and other demands from Section 3.2, future demands were calculated for the 20-year simulation period. Total demands for dry and critically dry years were decreased by 10% on the assumption that some additional conservation can be achieved in a drought.

Total imported surface water supplies available for the different types of years are shown in Table 3-2: Potential Supply Availability in Wet, Normal, Dry and Critically Dry Years.

For the simulation, the amount of local supply used to meet demand depended on the amount of imported surface water available. When imported surface water could not meet demand, increased amounts of local supply were used. Supplies from the Cienega and Arroyo dos Picachos projects were assumed to be available in 2005, and supplies from the Pacheco Creek

and Arroyo Las Viboras were assumed to be available in 2017. The amount of available local water included in the simulation was reduced from the figures in Table 3-2 to reflect meeting existing water rights.

When the total available supply was not sufficient to meet demand, the deficit was "withdrawn" from the groundwater/water bank. Conversely, when supplies were greater than demand, the excess supply was "deposited" into the bank. This assumption may overstate the true physical ability to bank excess water.

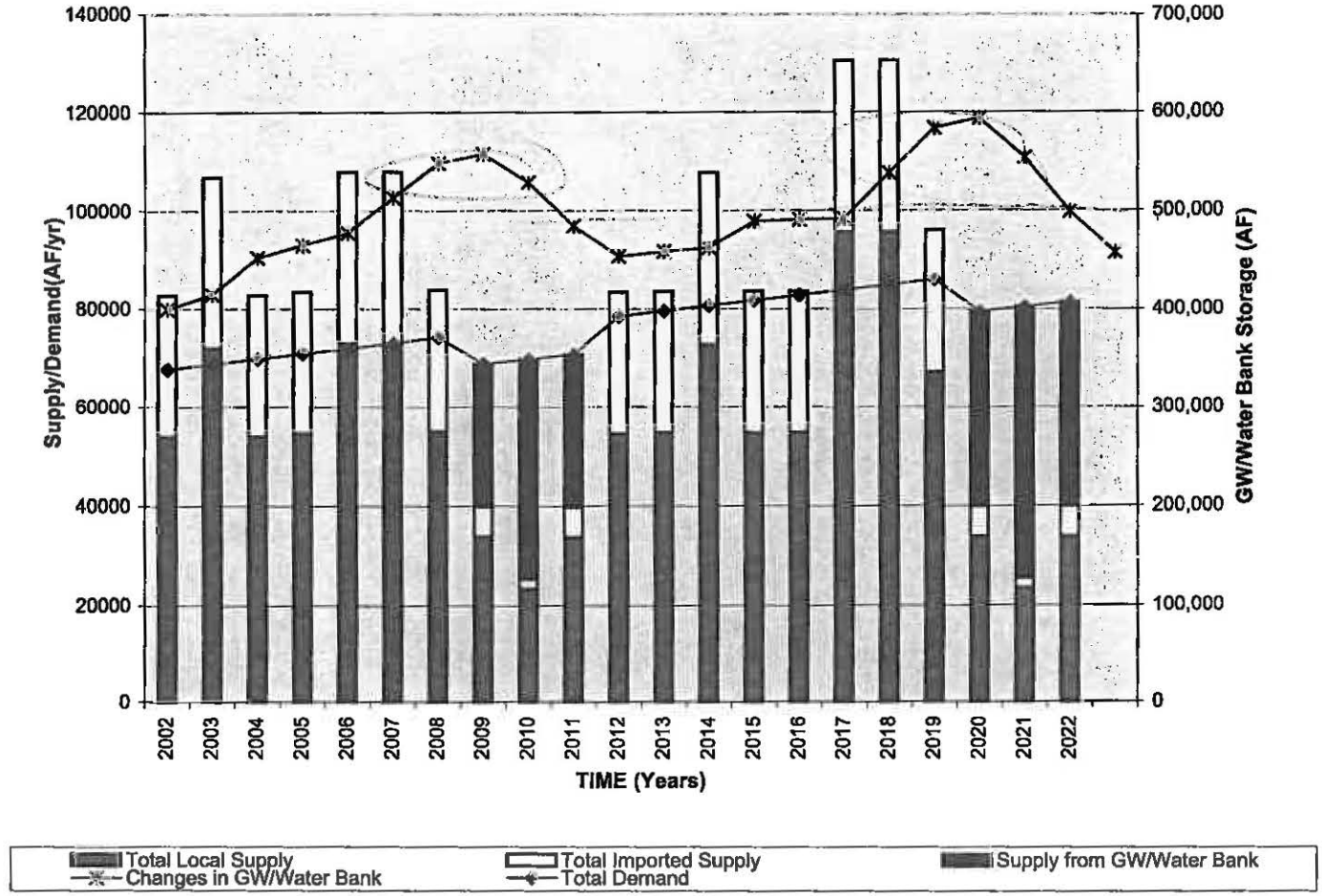
However, this assumption is sufficient for illustrative purposes and should be refined when developing a more detailed operations model and after further hydrogeologic studies. Calculations for the groundwater/water bank were based on the initial assumption that the beginning storage is 400,000 AF/yr.

Values for total demand, imported supply, local supply, supply from groundwater and surface water bank, and changes in groundwater/water bank are shown on Figure 3-1.

The 20-year simulation illustrates how a bank contributes to the reliability of a water supply system. Whether the bank occurs in a local groundwater bank, or a regional groundwater bank, the concept remains the same: when supplies are low, the bank will be used to make up shortfalls in demand.

The critical element of the bank is that contributions must be made to the bank when the water is available; otherwise, overdraft will result when too many withdrawals are made during times of low supply. It should also be noted that demand projections beyond 2025 may flatten and stabilize if land use plans and growth ordinances do not change significantly.

Figure 3 - 1 : Simulated Supply and Demand from 2002-2022 for San Benito County Groundwater Basin



Section 4: Objectives and Criteria for Groundwater Management Plan Implementation

The overall objective of the GWMP effort is to maintain and enhance the agricultural and economic productivity of San Benito County in an environmentally responsible manner. The objectives and criteria were initially developed in the 2001 Existing Conditions Report, and were expanded during the process of the preparation of the alternatives analysis presented in the Evaluation of Project Alternatives to Implement Groundwater Management Plan in San Benito County – Draft Report, June 2002 (June 2002 Draft Report). Specific criteria to achieve the overall goal are presented below.

4.1 Water Quantity Objectives and Criteria

- **Water Quantity Objective 1**: Maintain a reliable water supply for present and future users.

  Water Quantity Criterion 1-1: Deliver 100% of agricultural and M&I supply in normal and dry years, and in the first critically dry year of a drought.

  Water Quantity Criterion 1-2: Deliver at least 85% of M&I demands and 75% of agricultural demands in the second and subsequent critically dry years of a drought.

- **Water Quantity Objective 2:** Integrate the management of groundwater, surface water, and imported water, according to the following criteria:

  Water Quantity Criterion 2-1: Maximize efficient use of water supply by implementing water conservation programs for both M&I and agricultural uses. For existing M&I uses, it is assumed that over the next 20 years, water demand will decrease by 1% percent per year for existing residential dwelling units. Conservation will reduce demand from an estimated 420 gpd/du to 344 gpd/du. New development is assumed to have a demand of 312 gpd/du. Based on CVP guidelines, agricultural irrigation is assumed to be at 85% efficiency.

  Water Quantity Criterion 2-2: Provide new M&I water supplies to support planned growth within established urban (service) areas, in accordance with approved growth projections contained in the General Plans for San Benito County and the cities of Hollister and San Juan Bautista.

  Water Quantity Criterion 2-3: Manage groundwater levels to maintain groundwater storage for the protection of the water rights of the overlaying landowners and for emergency storage, limiting drawdown to the historic low levels of about 1977 to preclude and/or minimize the potential for ground settlement.

  Maintain groundwater levels, where practical, no higher than 20-30 feet below ground surface. In portions of the Bolsa, Pacheco, Hollister East and San Juan subbasins it will be impractical to achieve these groundwater levels and subsurface drainage systems

and other means of providing improved drainage conditions for the overlying uses will be required. In addition, higher groundwater levels will occur in areas adjacent to streams and where artificial percolation occurs outside of natural streams, such as in the vicinity of the percolation ponds of wastewater treatment plants, septic systems, and off stream groundwater recharge ponds.

Water Quantity Criterion 2-4: Optimize the use of groundwater storage.

4.2 Water Quality Objectives and Criteria

- **Water Quality Objective 1:** Provide water quality to meet both the needs of end users and the established objectives as described in the criteria below .

  Water Quality Criterion 1-1: Manage water resources to minimize imported salts and long-term levels of groundwater salinity to protect beneficial uses as set forth in the applicable revisions of the Regional Water Quality Control Board Basin Plan.

  Water Quality Criterion 1-2: Protect groundwater resources from infiltration of nitrates and salts, as well as other substances that could adversely affect groundwater quality.

  Water Quality Criterion 1-3: Deliver M&I water meeting primary and secondary drinking water quality objectives, with emphasis on achieving the "DHS's Recommended Limit for Consumer Acceptance" of not more than 500 mg/l of TDS and hardness of no greater than 120 mg/l as CaCO3. {It should be noted that there are no secondary standards for hardness; soft waters are typically considered to have 0-60 mg/l of hardness, moderately hard waters have 61-120 mg/l, hard waters have 121 - 180 mg/l, and very hard waters have over 180 mg/l of hardness.}

  Water Quality Criterion 1-4: Deliver agricultural water meeting established quality parameters. In order to optimize crop yield based on the available water sources, salinity (as measured by TDS), sodium hazard (as measured by Sodium Adsorption Ratio, or SAR); and boron have been selected as key indicator parameters. The following water quality objectives for these three water quality parameters have been developed.

  Salinity: <700 mg/L TDS

  SAR: <6.5

  Boron: <0.5 mg/L

  TDS: Levels that range from 480 - 1920 mg/L are considered marginal for irrigation, per Regional Water Quality Control Board Basin Plan.

- **Water Quality Objective 2:** Manage water resources to meet Regional Water Quality Control Board Basin Plan and Department of Health Services water quality objectives.

4.3 Other Objectives and Criteria

Additional criteria were developed to assist in evaluating other aspects of the implementation of groundwater management programs and projects.

4.3.1 Regional Criterion

The following regional criterion has been developed:

- **Regional Criterion 1:** The programs and projects of the groundwater management plan should be coordinated with regional water supply planning and projects to the extent that it is practical and feasible to do so.

- **Regional Criterion 2:** The major programs and projects of the groundwater management plan related to water quality and stream flows of the San Benito and Pajaro Rivers should be coordinated with local government and resources agencies in adjacent and downstream areas of the Pajaro River Watershed in Santa Clara, Monterey and Santa Cruz Counties and with the California Department of Fish and Game, National Marine Fisheries Service and U.S. Fish and Wildlife Service.

4.3.2 Environmental Resources Objectives

The following environmental resources criteria have been considered in the selection of toolbox elements for the GMP Update.

- **Environmental Resources Objective 1:** Minimize adverse effects on biological and cultural resources, including riparian habitats, habitats supporting sensitive plant or animal species, and archaeological/historic sites.

- **Environmental Resources Objective 2:** Avoid or minimize construction impacts from the various projects contained in the GMP Update.

- **Environmental Resources Objective 3:** Minimize operational energy requirements for the projects contained in the GMP Update.

- **Environmental Resources Objective 4:** The environmental impacts of each element should, to the maximum extent practicable, be mitigable to acceptable levels. Project elements should maintain and, to the extent practical, enhance the local environment and contribute to the long-term sustainability of agricultural, commercial, industrial and urban land uses and activity within the basin.

4.3.3 Institutional/Jurisdictional Objective

The following institutional/jurisdictional criterion has been developed.

- **Institutional/jurisdictional Objective 1:** The projects and programs in the groundwater management plan should be permittable and implementable, and shall be consistent with local and regional institutional constraints.

4.3.4 Cost Effectiveness/Affordability Objectives

The following cost effectiveness/affordability criteria have been developed:

- **Cost Effectiveness/Affordability Objective 1:** The programs and projects in the groundwater management plan should be affordable and financially feasible for urban and agricultural interests to implement over a predictable time period consistent with plan objectives. One measure of affordability will be the impact on water costs to urban and agricultural users over current and future baseline estimates.

- **Cost Effectiveness/Affordability Objective 2:** The programs and projects in the groundwater management plan should maximize the use of existing facilities.

Section 5: Elements of the Groundwater Management Plan Update

5.1 Development of the Project Elements

The Water Resources Association of San Benito County acknowledges the need to undertake programs and projects that improve the reliability and quality of the water available to its users. Many of these programs and projects are required to meet regulatory requirements, such as the primary and secondary drinking water standards, as well as wastewater effluent limits.

The programs and projects selected for the GMP Update have been derived from the preliminary evaluation of alternatives (June 2002 Draft Report) that compared the Project Toolbox Elements to the objectives and criteria. This comparison has resulted in the selection of Project Toolbox Elements that:

- Are practical and feasible (i.e. have no apparent fatal flaws and avoid sensitive environmental resources).
- Offer operational flexibility in the use of the various water resources available.
- Make creative use of opportunities/resources.
- Are cost-effective when compared to other Project Toolbox Elements that accomplish the same goal.

The selected Project Toolbox Elements are described below and include those in Alternative 4, with refinements as well as some additional project elements. Development of the programs and projects of the GMP Update are based on the following assumptions:

- Municipal and Industrial (M&I) water demands in the year 2022 are estimated to be 11,465 AF/yr.
- Agricultural and other water demands in the year 2022 are estimated to be 74,880 AF/yr.

5.2 Overview of Project Elements

The GWMP Update includes several types of water resource management programs that address:

- M&I Water Supply
- Agricultural Water Supply
- Groundwater Level Management

- Water Quality Management
- Agricultural
- M&I
- Wastewater Disposal

The following Project Toolbox Elements (Management Measures) have been selected for inclusion in the GMP Update. The Project Toolbox Elements can be divided into programs and projects/activities. Programs address issues such as water conservation, salt and nitrate education, ordinances, and economic incentives for water use. Projects/Activities will most likely result in capital infrastructure projects that will transport San Benito County water.

The programs and projects/activities contained in the Project Toolbox Elements have been divided into three general categories: 1) Institutional Programs; 2) Continuation of Existing Projects/Activities; and 3) New Projects/Activities.

1) Institutional Programs

- M&I Water Conservation
- Agricultural Water Conservation
- Salinity Education Program
- Water Softener Ordinance
- Industrial Salt Control in Municipal Wastewater Program
- Nitrate Education Program
- Well Construction and Abandonment Ordinance
- Maintain and Enhance Strategic Data Collection and Management Program
- Continue and Expand Economic/Regulatory Water Level Management Tools

These elements are ongoing, basin-wide programs that are the cornerstones of the GMP Update.

2) Continuation of Existing Projects/Activities

- Existing Groundwater Extraction Facilities
- Surface Water Importation
- Surface Water Treatment

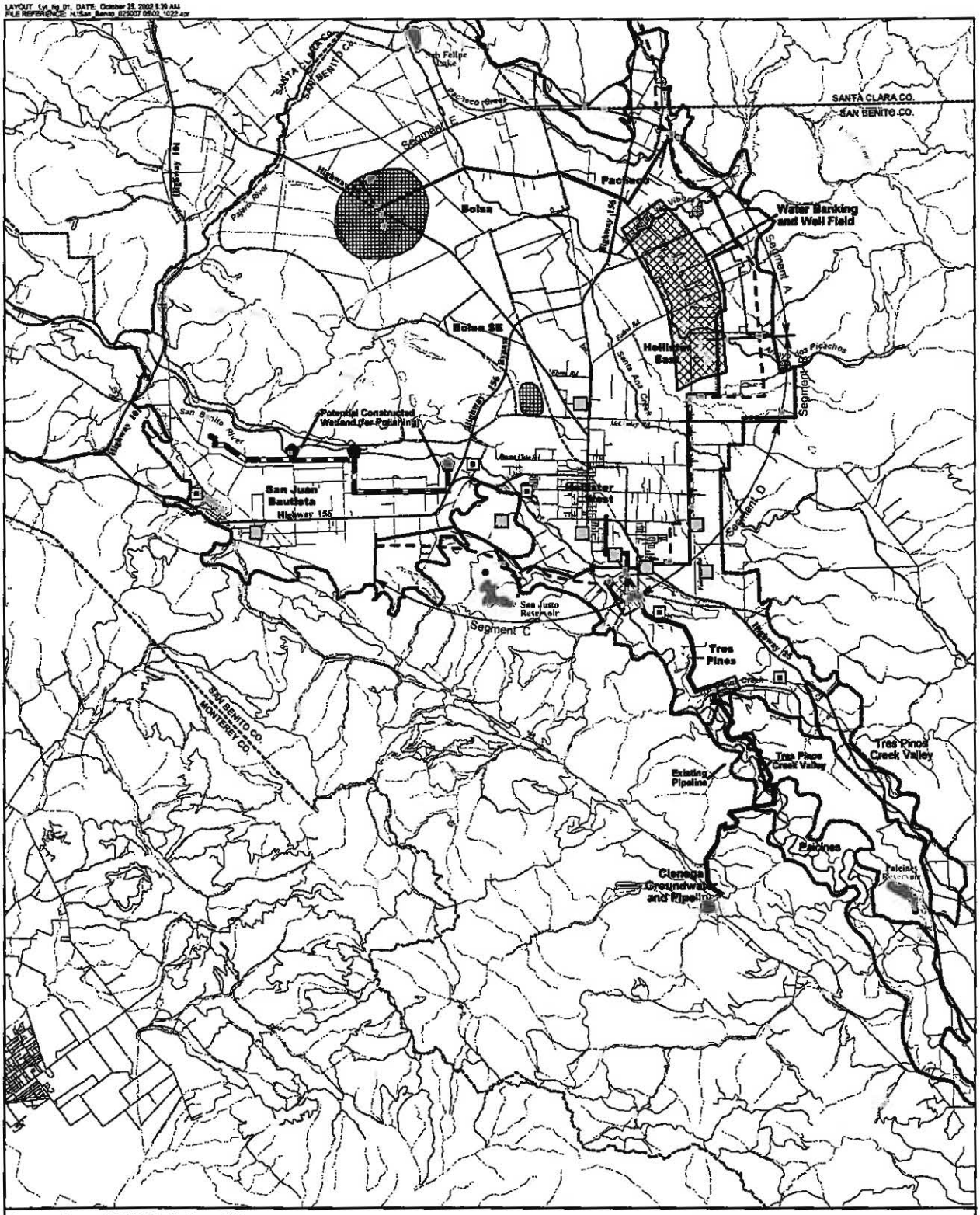
- M&I Wastewater Effluent Percolation
- Water Transfers
- In-Basin Water Banking
- Natural Direct Percolation
- Artificial Direct Percolation of Imported Surface Water
- In-lieu Banking of Imported Surface Water

3) New Projects/Activities

- Development/Improvement of High Quality Local Groundwater and Surface Water Supplies
- Regional and Local Conveyance Facilities For Multiple Water Supply
- Out-of-Basin Water Banking
- In-Basin Water Banking
- Natural Direct Percolation
- Artificial Direct Percolation of Local Surface Water
- In-Lieu Banking of Local Surface Water
- Aquifer Storage and Recovery of Imported and/or Local Surface Water
- Groundwater Treatment and Concentrate* Disposal
- Groundwater/Surface Water Blending
- Recycled M&I Wastewater Effluent for Direct Reuse
- Tile Drains for Localized Groundwater Level Management
- Tree Belt Evapotranspiration for Localized Groundwater Level Management/Wastewater Disposal
- Groundwater Pumping for Water Level Management

* Concentrate is the minerals/salts that remain after treatment of water through demineralization or desalting processes

- Constructed Wetlands for Treatment/Polishing of Agricultural Runoff
- Future Study of New Water Management Tools



Basemap reference: EDAW/TODD Engineers, 2001

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LEGEND

- Proposed Effluent for Direct Reuse
- Proposed Groundwater/Surface Water Treatment Facilities
- Proposed Seasonal Local Surface Water Development
- Potential Constructed Wetland
- Proposed/on-going In-lieu Percolation
- In Basin Water Banking and Well Field
- Proposed Local Conveyance Pipeline
- Proposed Cienega Groundwater Pipeline
- Proposed Agricultural Drain to Wetlands
- Hollister Conduit San Felipe Water System
- Groundwater Basin Boundary
- Groundwater Subbasin Boundary

Kennedy / Jenks Consultants

Water Resources Association of San Benito County

GROUNDWATER MANAGEMENT PLAN UPDATE PROJECT ELEMENTS

025007.05

April, 2004

Figure 5-1

Table 5-1: GMP Update Project Toolbox Elements and Program Matrix

Project Toolbox Element	M&I Water Supply	Agricultural Water Supply	GW Level Management	Water Quality Management		Wastewater Disposal
				Ag.	M&I	
Institutional Programs						
M&I Water Conservation	✓		✓			
Agricultural Water Conservation		✓	✓			
Salinity Education Program				✓	✓	
Water Softener Ordinance					✓	✓
Industrial Salt Control in Municipal Wastewater Program					✓	
Nitrate Education Program	✓	✓		✓	✓	
Well Construction and Abandonment Ordinance				✓	✓	
Maintain and Enhance Strategic Data Collection and Management Program	✓	✓	✓	✓	✓	✓
Continue and Expand Economic/Regulatory Water Level Management Tools	✓	✓	✓	✓	✓	
Continuation of Existing Projects/Activities						
Existing Groundwater Extraction Facilities	✓	✓	✓			
Surface Water Importation	✓	✓				
Surface Water Treatment	✓				✓	

Table 5-1: GMP Update Project Toolbox Elements and Program Matrix

Project Toolbox Element	M&I Water Supply	Agricultural Water Supply	GW Level Management	Water Quality Management		Wastewater Disposal
				Ag.	M&I	
Continuation of Existing Projects/Activities						
M&I Wastewater Effluent Percolation		✓		✓	✓	✓
Water Transfers	✓	✓	✓			
In-Basin Water Banking – Natural Direct Percolation[1]	✓	✓				
In-Basin Water Banking – Artificial Percolation of Imported and/or Local Surface Water[1]	✓	✓	✓	✓		
In-Basin Water Banking – In-lieu Banking of Imported and/or Local Surface Water[1]		✓	✓	✓		
New Projects/Activities						
Development/Improvement of High Quality Local Ground and Surface Water Supplies	✓	✓		✓	✓	✓
Regional and Local Conveyance Facilities for Multiple Water Supply Distribution	✓	✓	✓	✓	✓	
Out-of-Basin Water Banking	✓	✓	✓			
In-Basin Water Banking – Aquifer Storage and Recovery of Imported and/or Local Surface Water	✓	✓	✓	✓		
Groundwater Treatment and Concentrate Disposal	✓				✓	
Groundwater/Surface Water Blending	✓	✓	✓	✓	✓	
Recycled M&I Wastewater Effluent for Direct Reuse		✓	✓			✓
Tile Drains for Localized Groundwater Level Management			✓	✓		

Table 5-1: GMP Update Project Toolbox Elements and Program Matrix

Project Toolbox Element	M&I Water Supply	Agricultural Water Supply	GW Level Management	Water Quality Management		Wastewater Disposal
				Ag.	M&I	
New Projects/Activities						
Tree Belt Evapotranspiration for Localized Groundwater Level Management/Wastewater Disposal			✓	✓		
Groundwater Pumping for Water Level Management			✓			
Constructed Wetlands for Treatment/Polishing of Stormwater/Agricultural Runoff				✓	✓	

(a) Also applies to New Projects/Activities for Local Surface Water

Each Project Toolbox Element is described in further detail below and major issues and major benefits for each Element are identified. Those projects that can be identified with a general location are shown on Figure 5-1.

Table 5-2 shows the project toolbox elements and their applicability to the various sub-basins.

Table 5–2: Project Toolbox Elements and Sub-basin Applicability.

Project Toolbox Elements	Bolsa	Pacheco	Hollister East	Hollister West	Bolsa SE	San Juan	Tres Pinos
Institutional Programs							
M&I Water Conservation	✓	✓	✓	✓	✓	✓	✓
Agricultural Water Conservation	✓	✓	✓	✓	✓	✓	✓
Salinity Education Program	✓	✓	✓	✓	✓	✓	✓
Water Softener Ordinance			✓	✓		✓	
Industrial Salt Control in Municipal Wastewater Program			✓	✓		✓	
Nitrate Education Program	✓	✓	✓	✓	✓	✓	✓
Well Construction and Abandonment Ordinance	✓	✓	✓	✓	✓	✓	✓
Maintain and Enhance Strategic Data Collection and Management Program	✓	✓	✓	✓	✓	✓	✓
Continue and Expand Economic/Regulatory Water Level Management Tools		✓	✓	✓			
Continuation of Existing Projects Activities							
Existing Groundwater Extraction Facilities	✓	✓	✓	✓	✓	✓	✓
Surface Water Importation		✓	✓	✓	✓	✓	✓
Surface Water Treatment			✓	✓		✓	
M&I Wastewater Effluent Percolation			✓	✓		✓	✓
Water Transfers	✓	✓	✓	✓	✓	✓	✓
In-Basin Water Banking – Natural Direct Percolation[1]	✓	✓	✓	✓	✓	✓	✓
In-Basin Water Banking – Artificial Percolation of Imported and/or Local Surface Water[1]	✓		✓				✓
In-Basin Water Banking – In-lieu Banking of Imported and/or Local Surface Water[1]		✓			✓		

New Projects/Activities							
Development/Improvement of High Quality Local Ground and Surface Water Supplies	✓		✓				✓
Regional and Local Conveyance Facilities for Multiple Water Supply Distribution	✓	✓	✓	✓		✓	
Out-of-Basin Water Banking	✓	✓	✓	✓	✓	✓	✓
In-Basin Water Banking – Aquifer Storage and Recovery of Imported and/or Local Surface Water	✓		✓				
Groundwater Treatment and Concentrate Disposal			✓	✓		✓	
Groundwater/Surface Water Blending			✓	✓		✓	
Recycled M&I Wastewater Effluent for Direct Reuse			✓	✓		✓	
Tile Drains for Localized Groundwater Level Management						✓	
Tree Belt Evapotranspiration for Localized Groundwater Level Management / Wastewater Disposal						✓	
Groundwater Pumping for Water Level/ Management		✓	✓			✓	
Constructed Wetlands for Treatment/Polishing of Stormwater/Agricultural Runoff			✓	✓		✓	

(1) Also applies to New Projects/Activities for Local Surface Water

5.3 Institutional Programs

5.3.1 M&I Water Conservation

Description: The WRA members have joined to implement M&I Water Conservation by hiring an individual as a shared resource among the WRA members. For existing M&I uses, it is assumed that, over the next 20 years, water demand from existing residential units will decrease by 1% per year (J. Gregg, Personal Communication, 3 June 2002). At this rate of decrease of water demand, demands are expected to reduce from an estimated 420 gpd/du at present to 344 gpd/du in the future in existing residential units. Current ordinances for new residences in the city and county will restrict water use to approximately 312 gpd/du by using xeriscape landscaping and other water conservation measures. (Draft Environmental Impact Report for Northeast Fairview Specific Plan, October 1999).

Major Issues: The most important issue associated with this element is the implementation of water conservation programs and quantifying demand reductions over time.

Major Benefits: The most important benefit of this element is that it is an efficient use of the water supplies and represents a low-cost way to stretch water supplies.

5.3.2 Agricultural Water Conservation

Description: The conservation goal is to achieve 85% irrigation efficiency consistent with CVP water supply contract expectations. Agencies such as the Resource Conservation District and the San Benito County Farm Bureau assist agricultural water users in improving efficiency. It is expected that the efficiency improvements needed to meet the CVP guidelines for 85% efficiency will be achieved primarily by reducing evaporative losses during irrigation (J. Gregg, Personal Communication on 3 June 2002).

The SBCWD has developed a Water Management Program for M&I and agricultural supplies that is subject to review and approval by the USBR for all imported CVP water. The Best Management Practices identified under the Water Management Program include:

- Measurement of water to plus or minus 6% as required by the USBR.
- Designation of a water conservation coordinator. At present the SBCWD District Manager serves as the water conservation coordinator and for FY 02/03, the SBCWD Board has approved the addition of an agricultural/urban irrigation specialist.
- Provide or support water management services to water users. Services include providing:10 on-farm surveys per year and timely crop and water use information to each user; Irrigation scheduling and evapotranspiration information to water users; surface, ground, and drainage water quality data; and agricultural water management education programs and materials for farmers, staff, and the general public.
- Evaluation and improvement of SBCWD pump efficiencies.

- Other relevant items from the Best Management Practices include: facilitating use of recycled urban wastewater for crop use; facilitation of financing of capital improvements for on-farm irrigation systems; and optimize conjunctive use of surface and groundwater.

At present, the SBCWD does not have sufficiently detailed information (such as acreage by crop, including multi-cropping) to accurately estimate agricultural water use efficiency.

Major Issues: The most important issue associated with this element is implementation of the water conservation programs and tracking demand reductions over time.

Major Benefits: The most important benefit of this element is that it is an efficient use of the water supplies and represents a low-cost way to stretch water supplies.

5.3.3 Salinity Education Program

Description: Implementation of salinity education for both agricultural and M&I users will be crucial to managing salt loads to the groundwater basin. A preliminary salt balance that has been prepared as part of the San Benito County Water District's Annual Groundwater Report for Water Year 2001 indicates that imported CVP water, fertilizers from agricultural and urban users, and concentrate from water softeners from M&I users account for 20,941 tons per year or 53% of all of the salts entering the groundwater basin. Of the salts contributed, agricultural users account for 17,541 tons per year and urban users 3,400 tons per year.

Ongoing programs by agencies such as the Resource Conservation District and the San Benito County Farm Bureau assist agricultural water users in managing salt additions from fertilizers and other products to reduce salt infiltration to the local groundwater basin. Management of salinity, particularly from agricultural users, also reduces nitrate build-up in the groundwater. Salinity education of M&I users will occur primarily through implementation of the water softener ordinance described below.

Major Issues: The most important issue associated with this element is implementation of the salinity education program and tracking reductions in salt contributions over time.

Major Benefits: The most important benefit of this element is that it reduces salt input to the groundwater basin.

5.3.4 Water Softener Ordinance

Description: The salt balance in the Annual Groundwater Report for Water Year 2001 estimates that water softeners add 2,270 tons per year or 6 % of the total salt inputs to the groundwater basin. Although this source is small in comparison to other sources, it is a relatively easily controllable source of salts.

The urban water purveyors have implemented ordinances requiring new home water softeners to be the type that is regenerated offsite to prevent the introduction of salts into the sewer system. In addition, public education is ongoing regarding the need to regenerate softeners only when required. A retrofit ordinance applicable to resale of homes, and a grant program to assist existing homeowners in achieving conversion at lower cost is also under consideration.

Introduction of lower hardness water sources to the municipal water systems, such as the recently completed Lessalt Water Treatment Plant, will reduce the need for home water softeners.

Major Issues: The most important issue associated with this element is enforcement of the ordinance and implementation of the education program. Reductions in salt contributions over time will most easily be tracked in wastewater effluent samples.

Major Benefits: The most important benefit of this program is that it reduces a salt input that is relatively easy to control to the groundwater basin.

5.3.5 Industrial Salt Control in Municipal Wastewater Program

This program is intended to work cooperatively with food processors and other industrial dischargers whose operations contribute elevated levels of salts to municipal wastewater treatment plants.

5.3.6 Nitrate Education Program

This program is intended to work cooperatively with agricultural and municipal users on the use of soil amendments, fertilizers and other compounds that are applied to fields and landscaping to improve soil conditions and plant productivity.

5.3.7 Well Construction and Abandonment Ordinance

There are many wells in San Benito County that were not constructed to current standards and may be providing a means for vertical migration of poor quality water to deeper aquifers. These wells were most likely constructed with gravel pack seals to the ground surface and have not been properly abandoned so remain a threat to groundwater quality.

This program would include review of applicable current County well ordinances. The review would evaluate whether sufficient resources, processes, and procedures are available for enforcement of the ordinance. If necessary, additional ordinances or modifications to existing ordinances would be developed to be consistent with Department of Health Services and other standards for well construction and abandonment.

5.3.8 Maintain and Enhance Strategic Data Collection and Management Program

The San Benito County Water District currently gathers groundwater level and quality information and prepares an annual groundwater report. As practices such as groundwater banking and in-lieu percolation are expected to be practiced more intensively in the future, the need for groundwater data collection and analysis on a more frequent seasonal basis is expected to increase. This program is intended to further develop data collection and management so that timely decisions can be made regarding which water source can be used in each area.

More detailed information regarding data collection and management is found in Section 2.2

5.3.9 Continue and Expand Economic/Regulatory Water Level Management Tools

The SBCWD has developed a regulation that limits transfer of additional imported water into the San Juan sub-basin. This regulation was established to manage the current high groundwater levels in the San Juan. At the present time, the regulation is reviewed on an annual basis and decisions are made regarding the need to implement the regulation based on groundwater level data.

The SBCWD envisions development of additional regulations, policies, and economic incentives/disincentives to better distribute water to the areas in overdraft and to encourage the use of wells in those areas of high groundwater.

5.4 Continuation of Existing Projects and Activities

5.4.1 Existing Groundwater Extraction Facilities

Description: There are approximately 1,000 wells currently in the County that serve agriculture, community water systems in San Juan Bautista and Hollister area, and rural home users. Groundwater is readily available and is considered to be the predominant supply in the basin as shown in Section 3.2.1. For community water systems that use groundwater for M&I supply, additional treatment to remove hardness and salts will be required in the future as described further in Section 5.5.5. For agricultural users that have access to surface water, groundwater can be blended with surface water to improve the quality of the delivered water.

Major Issues: Declining water quality is the most important issue associated with the continued use of existing groundwater extraction facilities for M&I and agricultural supply. The water quality can be improved through the treatment and/or blending described below.

Major Benefits: Continued use of groundwater serves as an important element in the prevention of elevated groundwater levels that can negatively impact agricultural and residential areas. The facilities to extract groundwater are already in place and will not require significant additional capital expenditures other than possible treatment to remove salts.

5.4.2 Surface Water Importation

Description: Existing CVP surface water contracts allow up to 43,800 AF/yr of contract entitlement to the SBCWD of which 8,250 AF/yr is for M&I and 35,550 AF/yr is for agriculture deliveries. However, the levels for M&I supplies are often reduced to 75% of entitlement, and agricultural supplies are often reduced to less than 60% and as low as 0% of entitlement in severe drought conditions. The long-term average annual delivery is expected to be closer to 30,000 AF of which 7,000 AF/yr is for M&I deliveries and 23,000 AF/yr is for agriculture deliveries. CVP deliveries of 2,100 AF/yr are estimated for M&I during critically dry years.

Actual CVP deliveries to San Benito County are shown in Table 3-2 above and have averaged about 18,400 AF/yr. However, only a small fraction of M&I use of CVP water has been realized.

Draft CVP reliability guidelines for M&I indicate that if agricultural supplies are converted to M&I supplies, they still maintain the lower reliability of an agricultural supply. For example, in severe drought conditions, no water may be delivered if the entitlement has been converted from agricultural to M&I uses. The GMP Update assumes that the available CVP surface water for M&I uses can range from 1.9 MGD (2,100 AF/yr) to 7.4 MGD (8,250 AF/yr). Delivery of CVP water for M&I uses will require treatment in a surface water treatment plant as described below.

Major Issues: Importation of surface water for M&I uses instead of use of local groundwater can result in higher groundwater levels. Wastewater effluent disposal issues associated with percolation of effluent are exacerbated in areas of high groundwater. Therefore, continued long-term use of imported surface water for M&I will require careful management of groundwater levels. The relatively low reliability of this supply and the insufficient supply to meet 2022 M&I demands will require additional sources of water to be developed for M&I uses.

Major Benefits: The high quality of the CVP water with respect to hardness and TDS will result in reduced use of water softeners and the resulting reduction in salt concentration in wastewater effluent. Reduced salts in wastewater effluent will make the recycled water more attractive for direct reuse.

5.4.3 Surface Water Treatment

Description: As described earlier, the availability of imported CVP water for M&I uses is likely to range from an average flow of 1.9 MGD (2,100 AF/yr) to 7.4 MGD (8,250 AF/yr) while the total average demand is up to 10.2 MGD (11,465 AF/yr). Since there is a high probability that local surface water to make up the 2.8 MGD (3,215 AF/yr) difference between the total M&I demand and the available CVP water is available, it has been assumed for the GMP Update that up to 10.2 MGD of surface water treatment capacity will be required on an average basis.

Providing sufficient capacity for peak summertime demands will require distribution storage. Some distribution storage already exists within the City of Hollister, Sunnyslope County Water District, and City of San Juan Bautista systems. The Water Master Plan Update for the City of Hollister (September 1996) recommended the addition of 7 MG of storage to the existing 6 MG of storage already in the Hollister and Sunnyslope system. Construction of distribution storage is a requirement of operations of the water distribution system and will be the responsibility of each individual water purveyor.

In those dry and critically dry years when surface water may not be available for treatment, more groundwater will be required to make up the difference.

Surface water must be treated by filtration and disinfection processes to remove particles and pathogens from the water and to meet Federal and State drinking water requirements. Filtration alternatives for surface water treatment include conventional granular media filtration and microfiltration (MF) or ultrafiltration (UF) membrane filtration processes. Disinfection alternatives include the use of chlorine, ozone, or ultraviolet light (UV) to inactivate pathogens.

The recommended surface water treatment for San Luis Reservoir CVP water is MF or UF membrane filtration with chlorine or UV disinfection. This cost-effective process provides higher water quality, uses fewer chemicals, is easier to operate, and provides greater flexibility in meeting future water quality regulations than does the conventional treatment process.

The 3 MGD capacity Lessalt membrane filtration plant went into operation in November 2002 for the City of Hollister and Sunnyslope County Water District to deliver treated imported surface water in a portion of their service area. The Lessalt plant is expected to operate at full capacity most of the year. The City of San Juan Bautista has completed its California Environmental Quality Act (CEQA) document for a 1-MGD capacity membrane filtration plant. It is expected that it will take several years for the San Juan Bautista plant to have demands near full operational capacity.

Therefore, it is assumed for the GMP Update that up to 6.2 MGD, on average, of additional surface water treatment capacity would be required in the future to meet the projected M&I demands. Currently, Sunnyslope County Water District is in the early planning and design process for a 2 MGD capacity membrane filtration plant. If Sunnyslope's plant goes forward, then up to 4.2 MGD, on average, of additional treatment capacity will be required. The additional treatment capacity could be possibly economically achieved by expanding existing treatment plants with additional treatment units. However, in some cases, it may be desirable to locate a treatment plant in an area of development rather than constructing additional transmission pipelines. Up to five locations for surface water treatment plants have been identified and are shown conceptually on Figure 5-1. It should be noted that some of this capacity may not be required if groundwater demineralization facilities are constructed to meet the M&I demand.

Major Issues: The major issues associated with surface water treatment plants are with potential increases in water levels in the Hollister East and Hollister West sub-basins. The higher groundwater will be the result of: a) reduced groundwater pumping in the sub-basins because of the increased use of imported surface water and/or local surface water from another sub-basin and b) the additional wastewater effluent that is generated and disposed of in the wastewater percolation ponds.

Therefore, careful monitoring and management of groundwater levels in the Hollister East and Hollister West sub-basins will be required during the implementation of this Project Toolbox Element. It should be noted that the additional groundwater which will likely be developed to meet future M&I demands will offset, to some degree, the water level impacts of the use of imported water.

Major Benefits: The major benefits associated with the use of surface water and treatment through surface water treatment plants is the high quality of the CVP and/or local surface water with respect to hardness and TDS. The higher quality water will result in reduced use of water softeners and a resulting reduction in salt concentration in wastewater effluent. The reduced salt loading in the wastewater effluent will make it more attractive for direct reuse. In addition, the use of local surface water for M&I uses will result in even further reductions in salt inputs to the groundwater basin when compared to the salt inputs from imported surface water.

5.4.4 M&I Wastewater Effluent Percolation

Description: This Project Toolbox Element involves disposing of and/or storing M&I wastewater effluent through existing or new percolation ponds. M&I wastewater effluent disposed of and/or stored in percolation ponds must be treated to a sufficiently high quality to meet local groundwater quality objectives mandated by the Regional Water Quality Control Board. Increased percolation capacity can be achieved through redevelopment of existing ponds to increase rate of percolation, creation of additional ponds, development of ponds in other locations with higher capacity, and/or reduction of local groundwater levels to improve vertical groundwater gradients and therefore increase percolation rates.

M&I wastewater effluent percolation is now the primary mechanism for wastewater effluent disposal. Even as water recycling becomes more widespread, it is expected that use of percolation ponds will continue to serve as an alternative wastewater disposal method to address seasonal variations in recycled water demand and the expected need for wastewater disposal in wintertime. For the purposes of the GMP Update, it is assumed that M&I wastewater effluent percolation will continue to serve as a method of wastewater disposal in the groundwater basin area.

Major Issues: One of the major issues of this Project Toolbox Element is the ongoing concern for groundwater quality degradation and localized high groundwater associated with M&I wastewater effluent percolation.

Major Benefits: One of the major benefits of this Project Toolbox Element is that as source water quality improves, so will the M&I wastewater effluent and therefore will improve the water quality of the groundwater.

5.4.5 Water Transfers

Description: Assuming that water management activities free some of the imported water, then short-term or long-term water transfers of the imported water from the basin to outside users could generate revenue to help implement the programs of the GMP Update. It is assumed that execution of short-term water transfers to other entities or to Out-of-Basin water banks as discussed in Section 5.5.3 has already been reviewed for environmental impacts through on-going Federal and State permitting and review processes.

Major Issues: One of the major issues associated with water transfers is the need to obtain buy-in from current users of imported water to take delivery of groundwater and/or blended water of higher TDS than the imported water alone. Only when users accept groundwater or blended water will the imported water become available for transfer. In addition, depending on the length and degree of permanence of the water transfer, the negotiations to complete a water transfer could be complex and protracted.

Major Benefits: Some of the major benefits associated with transferring the use of imported water out of the groundwater basin are: the generation of revenue that can be used to help implement programs; the lowering of high groundwater levels that will occur with decreased application of imported water and increased groundwater pumping; and the reduction in imported salts that results from importing less surface water.

5.4.6 In-basin Water Banking

Description: Local water banking in the groundwater aquifer is an important component of managing water resources in the basin and storing water to improve the reliability of the water supply.

As described in earlier sections, there are a number of sources that could be banked in the groundwater basin including imported surface water and/or high winter flows in local streams. The potential mechanisms for banking include:

- Natural direct percolation,
- Artificial direct percolation of imported and/or local surface water,
- In-lieu banking of imported and/or local surface water, and
- Injection of imported and/or local surface water into groundwater storage and extraction of water from Aquifer Storage and Recovery (ASR) wells.

These mechanisms are discussed in greater detail below.

Use of percolated water in river channels or recharge basins would require extraction wells, while ASR would provide injection and extraction in a single facility. In-basin water banking will also require Regional and Local Conveyance Facilities for Multiple Water Supply Distribution to effectively distribute the banked water.

Natural direct percolation is an on-going natural process and is discussed briefly below.

At the present time, the greatest opportunity for artificial direct percolation appears to be in the Pacheco and northern portion of the Hollister East Sub-basins where percolation of imported surface water has historically occurred. Some in-stream percolation sites along the San Benito River in the Hollister West and San Juan sub-basins have also been studied. Although percolation sites have been identified in the San Juan sub-basin, the sub-basin has limited hydraulic capacity for water banking because of existing high water levels, and is further limited by poor ambient groundwater quality.

Southern Bolsa sub-basin has capacity for in-lieu banking because of the presence of a large groundwater depression and the availability of imported water. In-lieu banking is currently occurring in the Bolsa Southeast sub-basin where imported surface water is now used for irrigation, thus allowing natural direct percolation to refill a groundwater depression that had previously been overdrafted.

ASR could occur in any number of locations depending on the availability of storage capacity in the aquifer.

Major Issues: The major issue associated with water banking in general is ensuring that there is sufficient information regarding water levels, water quality, available storage capacity of aquifers, etc. to be able to make informed decisions about where and when to recharge water.

Major Benefits: The major benefit of groundwater banking is the ability to store a variety of source waters with relatively few environmental impacts when compared to surface water reservoirs. Water in storage will increase the reliability of the overall water supply system during dry years when groundwater can be used to offset reductions in imported water.

A more detailed discussion of the various in-basin water banking options follows:

5.4.6.1 Natural Direct Percolation

Natural direct percolation is an on-going process in the existing fields and waterways. The high proportion of agricultural land uses in San Benito County result in high levels of natural direct percolation, especially when compared to more urbanized areas with higher proportions of impervious surfaces. As long as the agricultural land uses, which are highly valued in San Benito County remain, natural direct percolation will also continue to occur at levels close to current levels.

5.4.6.2 Artificial Direct Percolation of Imported and/or Local Surface Water

Description: Similar to the Project Toolbox Element of Development/Improvement of High Quality Local Ground and Surface Water Supplies, if sufficient groundwater storage space and unused imported and/or local surface water is available, then water could be percolated in high permeability river/drainage channels for storage in the groundwater basin. The SBCWD currently stores excess imported water in the groundwater basin through percolation in highly permeable channels. However, rising groundwater levels in some areas have required the SBCWD to curtail percolation in an effort to better manage groundwater levels.

The Pacheco and northern Hollister East sub-basins, as shown on Figure 5-1, have been identified as areas for potential banking and withdrawals. At the present time this area has high groundwater levels that would have to be pumped down to allow water to be stored. It is expected that extraction of water banked in these areas can occur primarily through existing wells. There are over a thousand wells in San Benito County; it is expected that wells that are in good condition close to use areas and/or regional and local conveyance pipelines can be identified and arrangements made with the well owners to lease the wells.

The Hollister Conduit and/or the proposed regional and local conveyance facility could be used to convey the pumped water to either the southern Bolsa sub-basin or to other potential use areas that could be accessed by SBCWD's extensive CVP water delivery system.

In the Hollister West and San Juan sub-basins, eight in-stream percolation sites were studied along the San Benito River as shown on Figure 5-1 (Zone 3 and Zone 6 Annual Percolation and Groundwater Recharge Program, San Benito River Detention Basins, March 1995). The percolation facilities consisted of simple berms with culvert spillways and slide gates to control the flow. The berms reduce the flow rate, increase water depth, and allow more percolation than occurs through the natural river channel.

Although not specifically studied, there may be off-stream percolation facilities that can be constructed close to the in-stream percolation sites that would increase the area of percolation, and hence the volumes of water that could be percolated. Studies conducted by the SBCWD in

cooperation with Granite Rock Incorporated indicate that in some locations, sustained percolation rates as high as 1 foot/day were observed (J. Gregg, Personal Communication, 28 August 2002). Off-stream percolation may also extend the length of time that percolation can occur and therefore the volume of water that could be percolated.

The San Benito River percolation sites would also benefit from development of a dedicated shallow well-field to extract the water. It is expected that water would be pumped out of the San Benito River gravels and into the Hollister Conduit and/or the regional and local conveyance pipelines to the use areas. Some existing deeper wells could also be used for extraction.

Major Issues: The major issue associated with artificial direct percolation is that all of the proposed artificial direct recharge locations have high groundwater levels as a result of the use of imported water in the area. In addition, Hollister West has the additional consideration of treated wastewater effluent percolation that impacts groundwater levels . Therefore, artificial direct recharge will require careful selection of recharge areas and monitoring and management of water levels.

SBCWD has been awarded an AB 303 grant to further develop and automate their on-going groundwater level and quality monitoring. Improved data will assist the SBCWD in identifying areas appropriate for groundwater banking and withdrawal and in evaluating local water quality. In addition, careful evaluation of the quality of the source and native waters will be required to minimize the potential for aquifer plugging and other negative impacts.

Major Benefits: The major benefit associated with imported surface water percolation is that it allows for the storage of high quality water when the water is available thus increasing the reliability of water supply to the San Benito County users.

5.4.6.3 In-lieu Banking of Imported and/or Local Surface Water

Description: As described earlier, in-lieu banking is currently occurring in the Bolsa Southeast sub-basin through the extension of the delivery system for imported water to the sub-basin. By using the imported water, groundwater is not being pumped and the groundwater recharge that is occurring remains in storage. Therefore, by providing imported water in-lieu of pumping groundwater, water banking is occurring.

It is expected that the in-lieu banking effort will result in mitigation of the groundwater depression that has formed by allowing direct natural percolation to recharge the sub-basin. Evidence of the decrease in the size and depth of the groundwater depression has been documented in the recent Annual Groundwater Reports.

In-lieu banking in Bolsa Sub-basin is described below in the New Projects/Activities section.

Major Issues: The major issues associated with in-lieu banking through the delivery of alternative water supplies is that careful monitoring of the water levels must occur. Prior to delivery of imported surface water to San Benito County, the entire groundwater basin was in overdraft. Since imported surface water deliveries began in 1997, the overdraft condition in those areas receiving imported surface water has largely been mitigated. In some cases, deliveries have resulted in oversupply and corresponding high groundwater levels.

Major Benefits: The major benefit associated with in-lieu banking is that it offers opportunities to increase the quantity of banked water, and thus increases the reliability of the overall groundwater system for use during droughts.

5.5 New Projects/Activities

5.5.1 Development/Improvement of High Quality Local Ground and Surface Water Supplies

Description: This Project Toolbox Element addresses underutilized, high-quality water resources in the groundwater basin. These consist either of previously-developed resources with facilities that have fallen into disrepair, or of resources with unexercised water rights. These water sources include:

- Redevelopment of City of Hollister's water right for additional local groundwater extraction at Cienega Valley.
- Development of groundwater resources in the Pacheco sub-basin for transfer to other sub-basins.
- Development of SBCWD's Arroyo Dos Picachos surface water right.
- Development of new surface water rights on Arroyo Los Viboras.
- Development of unused surface water on Pacheco Creek.

With the exception of the Cienega and Pacheco sub-basin groundwater supplies which are available year-round, most of the surface waters are only available in the winter and late spring. These surface water sources could be developed further using seasonal diversion dams. The water could then be percolated in-place if in-stream percolation and aquifer storage capacity are available, directed into surface water pipeline systems for conveyance to a banking area, or delivered directly to agricultural or M&I users.

Major Issues: The major issue associated with this Project Toolbox Element is the need to have sufficient storage available for use during the summer months. Banking of the surface waters in the groundwater aquifer will require careful management of the basin. Potential environmental impacts to riparian areas may be associated with seasonal diversion dams and the provision of adequate flows for possible fish passage.

Major Benefits: One of the major benefits associated with this Project Toolbox Element is that it provides a relatively low-cost, high quality water source. Also, use of local surface waters reduces importation of salts, and use of wet weather diversion may offer some measure of flood control. The Pajaro River Watershed Flood Management Authority has identified potential flood control opportunities on the San Benito River as it passes through Hollister; diversion on upstream waterways may offer similar benefits.

These specific proposed water sources are discussed in greater detail below.

5.5.1.1 Cienega Valley Groundwater Source

Description: The Cienega Valley water source, located to the south of the City of Hollister as shown on Figure 5-1, is the historic water source for the City. However, landslides in 1983 damaged the pipeline that delivered the water and water rights adjudication that occurred soon thereafter reduced the quantity of water that the City could deliver. As a result, the project to rehabilitate and replace the damaged pipeline (shown on Figure 5-1) was economically infeasible and not pursued. The City made pipeline repairs to serve a limited number of customers close to the Cienega Valley source and continues to make pipeline repairs needed to serve those existing customers. Cienega Valley water is not currently delivered to customers within Hollister's city limits because that portion of the pipeline has not been repaired.

The water quality of Cienega Valley is excellent with TDS less than 200 mg/l. Extraction of Cienega Valley waters occurs through either of two shallow wells constructed adjacent to Pescadero Creek. The City's adjudicated water right No. 14797 from 1988 in Cienega Valley is for a maximum diversion of 489.41 AF/year with a monthly maximum diversion of 40.78 AF. In the past, water had been available from the Cienega Valley on a year-round basis. The proposed capacity of the pipeline from the Cienega Valley is 1.5 MGD (1,050 gpm or 1,679 AF/yr) (Cienega Pipeline – 1983 Damage Assessments, April 1983).

Because the wells are shallow and adjacent to Pescadero Creek, the water may be considered groundwater under the direct influence of surface water according to current drinking water regulations. As a result, use of Cienega Valley water for M&I supply may require treatment under the Surface Water Treatment Rule as a opposed to the disinfection-only that occurred previously. If the water is delivered to the Hollister Conduit as envisioned, the water could be treated at one of the existing or proposed surface water treatment plants.

It is envisioned that the Cienega Valley water could be brought to and commingled with CVP water at the downstream end of the CVP System in Tres Pinos. Connection of the San Felipe and Cienega systems would require about one mile of pipeline between the proposed Cienega Valley replacement pipeline and the Hollister Conduit. It appears that there would be sufficient head in the Cienega Valley pipeline such that a booster pump station would not be required.

The City's allocation of Cienega Valley water could then be exchanged with the SBCWD's CVP water and the City could take its allocation as CVP Water further upstream. The commingled Cienega Valley/CVP water would be delivered by SBCWD to downstream users.

Major Issues: The major issues with this source of water are the relatively low quantities available, and the potential costs of delivery.

Major Benefits: The major benefits of this source of water are its high quality and high reliability. Also, the presence of additional supply sources offers operational flexibility in serving water users.

5.5.1.2 Pacheco/Northern Hollister East Sub-basins Groundwater Pumping

Description: As a result of the delivery of CVP water, the Pacheco and Northern Hollister East sub-basins have an estimated surplus of 4,000 AF/yr of water that is banked in the local

groundwater sub-basin (U.S.B.R., 1972). This surplus is in direct proportion to the amount of water that is imported. SBCWD is currently managing groundwater levels in the Pacheco and Northern Hollister East Sub-basins by limiting the amount of summertime percolation releases of CVP Water.

Banked water, which is discussed later in Section 5.5.4, could be pumped to the Hollister conduit and/or the proposed regional and local conveyance pipelines, as shown on Figure 5-1, for delivery either to the southern portion of Bolsa sub-basin where there is a historic overdraft, or to San Juan or other sub-basins.

The expected water quality from the Pacheco/Northern Hollister East sub-basins is on the order of 700 – 800 mg/l TDS and 2-3 ppm boron. It is likely that blending with local or imported water sources will be required to reduce boron concentrations to levels acceptable to agricultural and other users. Pacheco/Northern Hollister East sub-basin water could also be blended with the native San Juan groundwater to reduce local groundwater TDS concentrations.

Major Issues: The major issues with this source of water are the potential costs of delivery and the need for blending to reduce boron levels.

Major Benefits: The major benefits of this source of water are its high reliability and relatively high quality. Also, the presence of an additional supply source offers operational flexibility in serving water users.

5.5.1.3 Arroyo Dos Picachos Water Supply Development

Description: The SBCWD holds an existing water right to divert up to 4.75 cfs from 1 December of one year to 1 May of the subsequent year. If the 4.75 cfs were available for the full 151 day period, a total of up to 1,422 AF/yr may be available on Arroyo Dos Picachos. The water right is structured such that diversions from Arroyo Dos Picachos can occur when there is active flow from Arroyo Dos Picachos into Arroyo Los Viboras that occurs during the wet season. In the past, the water was percolated over 2 miles of the Arroyo Dos Picachos channel bed. More recently, much less channel length has been available for percolation as a result of changes in local land uses. The SBCWD considers this water right to be underutilized. Review of water rights Decision No. 409 indicates that the Pacheco Pass Irrigation District may also have the right to divert up to 45.25 cfs from Arroyo Dos Picachos.

As described earlier in Section 3.1.2, Arroyo Dos Picachos water supply availability estimates were made based on simulated stream flows as part of the preparation of the SBCWD Annual Groundwater Reports. Using the simulated stream flows for a period from water year 1984 through water year 2001, the average availability on Arroyo Dos Picachos ranges from a minimum of 100 AF/yr to a maximum of 7,720 AF/yr with an average availability of 2,100 AF/yr. Based on a simulated stream flow, it appears that the 1,422 AF/yr water right held by the SBCWD could be available during most wet and normal years, provided that the Pacheco Pass Irrigation District does not exercise its water rights.

The water rights Decision No. 409 that apparently appropriate an additional 45.25 cfs to the Pacheco Pass Irrigation District should be reviewed carefully. It does not appear that an additional 45.25 cfs from Arroyo Dos Picachos would be available at any time.

An existing diversion structure that is sufficient for two 5'-wide slide gates is located on the Arroyo, as shown on Figure 5-1. It is envisioned that the existing diversion structure will require rehabilitation and improvement, and that some of the existing upstream channel will have to be reshaped to create a small impoundment. A small pump station would need to be constructed adjacent to the impoundment. The pump station would be used to pump water out of the impoundment and into a proposed 1.3 mile pipeline to the Hollister Conduit and/or proposed regional and local conveyance pipeline for delivery to either M&I or agricultural users or to water banking sites for percolation or ASR.

During the time that the Arroyo Dos Picachos water is available for M&I use, it would replace CVP water. If it is anticipated that the full CVP water allocation will not be used during a given water year, then the unused CVP water could be put onto the open market for a short-term sale or transfer, thus generating revenues to help fund projects.

The water quality of the Arroyo Dos Picachos is estimated to have electrical conductance of 30 (Kx 10^5 at 25C), 25 percent sodium, and boron at 0.15 ppm (Reconnaissance Report, Hollister Project, Pajaro River Basin, California, January 1954). This is approximately a TDS of 500 mg/l and/or EC of 800 umhos/cm and would be characterized as good quality water.

Major Issues: The major issues with this source of water are the potential costs of delivery facilities and the need for some construction in the channel of the arroyo and the associated environmental impacts that would require additional documentation and permitting. Maintaining adequate late spring and winter flows to allow for possible steelhead passage in Arroyo Dos Picachos is also a concern.

Major Benefits: The major benefits of this source of water are its relatively high reliability and quality. In addition, having additional supply sources offers operational flexibility in serving the water users.

5.5.1.4 Arroyo Los Viboras Water Supply Development

Description: The Pacheco Pass Water District (PPWD) has an existing diversion on the Arroyo Los Viboras downstream of where the Hollister Conduit crosses the arroyo as shown on Figure 5-1. The PPWD diverts approximately 1.5 cfs to a small percolation pond nearby.

A review of water rights decisions for Arroyo Los Viboras indicates that up to 13.685 cfs or up to 1,781.7 AF/yr of water has been allocated. The estimate of water supply availability made in Section 3.1.2 indicates that a minimum of 149 AF/yr, a maximum of 11,583 AF/yr and an average of 3,159 AF/yr may be available from Arroyo Los Viboras. Accordingly, there may be up to 1,377 AF/yr of unadjudicated seasonal water rights available during an average year. It is anticipated that additional diversions of excess flow would only occur after the Arroyo Las Viboras and downstream water ways have reached a predetermined level of flow.

In order to utilize the 1.9 cfs or 1,377 AF/yr water that is unajudicated, the diversion structure may have to be modified such that a small impoundment can be formed. A small pump station would be constructed adjacent to the impoundment. The pump station would be used to pump water out of the impoundment and into a proposed 3/4 mile pipeline to the Hollister Conduit

and/or proposed regional and local conveyance pipeline for delivery to either M&I or agricultural users or to water banking sites for percolation or ASR.

As in the Arroyo Dos Picachos, during the time that the Arroyo los Viboras water is available for M&I use, it would replace CVP water. If the full CVP water allocation is anticipated not to be used during that wet year, then the unused CVP water could be put onto the open market for a short-term sale or transfer thus generating revenues to help fund projects.

The water quality of the Arroyo Los Viboras is estimated to have electrical conductance of 51 (Kx 10^5 at 25C), 24 percent sodium, and boron at 0.52 ppm (Reconnaissance Report, Hollister Project, Pajaro River Basin, California, January 1954). This is approximately a TDS of 360 mg/l and/or EC of 510 umhos/cm and would be characterized as good quality water.

Use of the unadjudicated wet season water would require coordination with PPWD and development of any institutional arrangements for the use of the existing diversion structure. A water right filing for the remaining 1.9 cfs or more will have to be filed.

Major Issues: The major issues with this source of water are the need to develop an institutional arrangement with PPWD, the potential costs of delivery facilities, and the need for some construction in the channel of the arroyo and the associated environmental documentation and permitting. As Arroyo De Las Viboras is apparently too dry to support stream fishes (Dr. Jerry Smith, May 2002), fish passage is not a major concern on this arroyo.

Major Benefits: The major benefits of this source of water are its relatively high reliability and quality. In addition, having additional supply sources offers operational flexibility in serving the water users.

5.5.1.5 Pacheco Creek Water Supply Development

Description: Pacheco Creek is estimated to have up to 7,200 AF/yr of safe yield for surface delivery based on a 61,000 AF storage reservoir after 6,800 AF/yr of percolation releases have been made (Reconnaissance Report, Hollister Project, Pajaro River Basin, California, January 1954). Although this quantity is not equivalent to the excess wet weather flows that may be available, it does provide an order of magnitude estimate of the available flows from Pacheco Creek. Water rights Decision No. 187 from 1928 indicates that the Hollister Irrigation District may have a water right for up to 11,000 AF/yr (15.19 cfs for 365 days) and the Pacheco Pass Irrigation District may have a water right to up to 16,000 AF/yr (22.10 cfs for 365 days).

The estimated water supply availability prepared as part of Section 3.1.2 indicates that Pacheco Creek may have a minimum of 800 AF/yr, a maximum of 92,887 AF/yr , and an average of 25,551 AF/yr water supply available.

There is an existing small dam on Pacheco Creek as shown on Figure 5-1. The ownership of the dam has not been determined at this time. It is envisioned that the dam could be modified, perhaps with an inflatable dam, resulting in the creation of a larger impoundment. A small pump station and approximately 1,000 feet of pipeline would be required to convey water from Pacheco Creek to the Hollister Conduit and/or the proposed regional and local conveyance

pipeline for delivery to either M&I or agricultural users or to water banking sites for percolation or ASR.

As in the other surface water diversion locations, during the time that the Pacheco Creek water is available for M&I use, it would replace CVP water. If the full CVP water allocation is anticipated not to be used, then the unused CVP water could be put onto the open market for a short-term sale or transfer, thus generating revenues to help fund projects.

In the summertime, the PPWD releases water from Pacheco Dam for percolation. However, it is possible that these releases may be exacerbating high groundwater levels in San Benito County. Institutional arrangements could be made between San Benito County and PPWD to better manage those releases such that lower groundwater levels can be maintained.

The water quality of Pacheco Creek is estimated to have electrical conductance of 33.7 ($K \times 10^5$ at 25C), 22 percent sodium, and boron at 0.09 ppm (Reconnaissance Report, Hollister Project, Pajaro River Basin, California, January 1954). This is approximately a TDS of 235 mg/l and/or EC of 337 umhos/cm and would be characterized as good quality water.

Some institutional arrangements with PPWD should be made regarding releases. The Hollister Irrigation District water right will need to be reviewed and evaluated for transferability to the SBCWD. Based on review and analysis of the and estimated records for flows on Pacheco Creek, it appears that some additional wet weather flows could be recovered.

Major Issues: The major issues with this source of water are the need to develop an operational plan for summertime releases with PPWD, the potential costs of delivery facilities and the need for some construction in the channel of the creek and the associated environmental documentation and permitting. Maintaining adequate late spring and winter flows to allow for possible steelhead passage in Pacheco Creek is also a concern.

Major Benefits: The major benefits of this source of water are its relatively high reliability and quality. In addition, having additional supply sources offers operational flexibility in serving the water users.

5.5.2 Regional and Local Conveyance Facilities for Multiple Water Supply Distribution

Description: Regional and local conveyance pipelines increase the operational flexibility of the water system by allowing movement of water either: a) to and from groundwater banking areas or b) from local surface water sources to use areas. Regional conveyance pipelines traverse longer distances and would be of larger diameter while local conveyance pipelines would be to connect facilities such as wells and surface water sources and would be of smaller diameter. For the purposes of the GMP Update, it is assumed that the backbone regional conveyance would include:

- Approximately 13.8-miles of 18-inch pipeline located approximately 10 – 15 feet away from and parallel to the existing Hollister Conduit or along existing County roads. The pipeline would extend from the Pacheco Sub-basin to the eastern edge of the San Juan

Sub-basin. This pipeline could deliver a range of source waters including imported and/or local surface water and pumped groundwater or a blend of the above to users in Hollister East, Hollister West, and San Juan sub-basins.

- Approximately 7.5 miles of 18-inch pipeline extending from the northern end of the pipeline described above to the east along Shore Road and other county roads to the junction of Highway 25. This pipeline could deliver a range of source waters including imported and/or local surface water and pumped groundwater or a blend of the above to the areas in the Bolsa sub-basin where groundwater overdraft is currently occurring.

The pipeline segments are shown on Figure 5-1 and have been further sub-divided to facilitate phased construction for the purposes of preparing estimates of probable costs of construction (Section 6). Additional conveyance pipelines may be required in the future as source, use, and storage areas are further developed. Pump stations will also most likely be required, but they have not been sized or located at this time. Pump stations would be located adjacent to the pipeline. The first segment of the Regional and Local Conveyance Facilities for Multiple Water Supply Distribution will parallel the Hollister Conduit or along existing County roads and will be able to intertie, if desired, with the extensive imported water delivery system operated by the SBCWD. An intertie would allow delivery of a range of water to many users.

Major Issues: The major issue associated with development of Regional and Local Conveyance Facilities for Multiple Water Supply Distribution is to locate the facilities so that they have minimal impact to environmental resources such as wetlands and habitat areas. Most of the environmental impacts associated with Regional and Local Conveyance Facilities for Multiple Water Supply Distribution would likely be short-term during construction of the pipeline and appurtenant facilities, and should be mitigable.

Major Benefits: Operational flexibility is the primary benefit of regional and local conveyance pipelines. Other benefits include:

- Will allow efficient use of groundwater banking of either local or imported surface water.
- Can be used to move the higher quality groundwater found in the northern portions of the groundwater basin to the southern portions where water quality is not as good.
- Can be used to move groundwater for blending with surface water to improve water quality.
- Can be used to move local surface water available during wet weather periods to areas of groundwater banking or to M&I surface water treatment plant.
- Can be used to move recycled water to agricultural use areas

5.5.3 Out-of-basin Water Banking

Description: Water banking can occur in a regional/statewide bank that would be under a contractual arrangement with a water bank operator such as the Kern Water Bank or the Semi-Tropic Water Bank. Excess CVP contract water from San Benito County, generated when other local surface waters such as described in Section 5.5.1 above are developed, could be stored in

a regional/statewide bank; conversely, water owned by the regional/statewide water bank could be purchased by San Benito County agencies for delivery during dry years.

Major Issues: The major issues associated with out-of-basin water banking are the institutional arrangements that need to be made to store, extract and deliver the water when needed and the costs of water banking.

Major Benefits: The major benefits associated with out-of-basin water banking are that it offers additional operational flexibility and reliability. If excess CVP water is available but cannot be used or banked within San Benito County, then out-of-basin water banking allows San Benito County to retain the water for use in the future.

5.5.4 In-basin Water Banking

Description: As described above in the Continuation of Existing Projects/Activities section, local water banking in the groundwater basin is an important component of managing water resources in the basin and storing water to improve the reliability of the water supply.

The only difference with the activities that occurred as described above are:

- In-lieu banking would be added to the Bolsa sub-basin.
- ASR, which is not currently being practiced, is added as a project toolbox element.
- Local surface water could be added as a water source.

In-basin water banking will also require Regional and Local Conveyance Facilities for Multiple Water Supply Distribution to effectively distribute the banked water.

Natural direct percolation is an on-going natural process that has been previously discussed.

At the present time, the greatest opportunity for artificial direct percolation appears to be in the Pacheco and northern portion of the Hollister East Sub-basins where percolation of imported surface water has historically occurred. Some in-stream percolation sites along the San Benito River, in the Hollister West and San Juan sub-basins, have also been studied. Although percolation sites have been identified in the San Juan sub-basin, the sub-basin has limited hydraulic capacity for water banking because of its high water levels and is further limited by the poor quality of the groundwater that may be stored there.

Southern Bolsa sub-basin has capacity for in-lieu banking because of the presence of a large groundwater depression. Through the delivery of imported surface water, natural direct percolation would refill the groundwater depression that has historically occurred.

ASR could occur in any number of locations depending on the availability of storage capacity in the aquifer.

Major Issues: The major issue associated with water banking in general is ensuring that there is sufficient information regarding water levels, water quality, available aquifer storage capacity, etc. to be able to make informed decisions about where and when to recharge water.

Major Benefits: The major benefit of groundwater banking is the ability to store a variety of source waters with relatively few environmental impacts when compared to surface water reservoirs. Water in storage will increase the reliability of the overall water supply system during dry years.

A more detailed discussion of the various in-basin water banking options follows:

5.5.4.1 In-lieu Banking of Imported and/or Local Surface Water

Description: As described earlier, in-lieu banking has been practiced in the Bolsa Southeast sub-basin since construction of the extension of the delivery system for imported water to the sub-basin. By using the imported water, groundwater is not being pumped and the groundwater recharge that is occurring remains in storage. Therefore, by providing imported water in-lieu of pumping groundwater, water banking is occurring.

There is also potential for in-lieu banking in the southern portion of the Bolsa sub-basin where a large groundwater depression has developed. The Bolsa sub-basin is not currently a part of Zone 6 of San Benito County that receives imported surface water. However, the proposed regional and local conveyance pipeline to the southern portion of the Bolsa sub-basin would allow delivery of local surface water or pumped groundwater to the area of groundwater depression for agricultural use, thus allowing direct natural percolation to recharge the sub-basin.

Major Issues: The major issues associated with in-lieu banking through the delivery of alternative water supplies is that careful monitoring of the water levels must occur. Prior to delivery of imported surface water to San Benito County, the entire groundwater basin was in overdraft. Since imported surface water deliveries were initiated in 1997, the overdraft condition in areas receiving imported surface water has largely been eliminated; in some cases, the practice has resulted in oversupply and correspondent high groundwater levels.

Major Benefits: The major benefit associated with in-lieu banking is that it offers opportunities to increase the quantity of banked water and thus increases the reliability of the overall groundwater system for use during drought periods.

5.5.4.2 Aquifer Storage and Recovery of Imported and/or Local Surface Water

Description: Aquifer storage and recovery (ASR) facilities are specially designed wells that operate as both injection wells and extraction wells. Potential well locations must be studied through evaluation of hydrogeologic data and field testing, so that appropriate locations with aquifer conditions allowing for injection and extraction can be selected.

In general, regardless of whether an imported or a local surface water is used for ASR, either coagulation or filtration of the source water is required so that large particles can be removed prior to injection. Failure to remove large particles can result in plugging of the well screen and

even the aquifer; both of which will reduce injection and extraction rates. It is expected that local surface waters may be particularly high in particulates because they will be wet weather flows that result in higher rates of soil erosion than base flows. Therefore treatment of local surface waters prior to injection will be particularly critical.

A study conducted by SBCWD indicated that levels of suspended materials in San Felipe water are high enough that filtration is necessary prior to injection. As a result, it does not appear that ASR is practical/cost-effective for general purposes. However, if excess treated San Felipe water is available, it could be injected. ASR is most practical in an area close to planned surface water treatment facilities.

For the purposes of the groundwater management plan, ASR remains an option that could be used. However, alternative methods of recharge may prove more cost-effective at this time. If ASR facilities are to be developed, they will likely be located near the proposed regional and local conveyance pipeline or the imported surface water distribution system assuming that sites with the appropriate hydrogeology can be identified.

Major Issues: As with the other methods of water banking, one of the major issues is selection of appropriate sites for ASR based on water levels and aquifer characteristics. Careful evaluation of the quality of the source and native waters will be required to minimize the potential for aquifer plugging and other negative impacts. ASR is likely to be more energy intensive than other water banking methods because of a commonly occurring need to pump water into the aquifer. In some cases, ASR sites that allow gravity percolation may be found. However, if gravity percolation cannot occur, then pumping will be required. ASR may prove to be less cost-effective than other water banking methods because of the extensive investigation required and the extensive capital facilities including pumping, well, and treatment facilities required.

Major Benefits: One of the major benefits of ASR is that it requires a smaller footprint than percolation facilities. In addition, the same facility can be used for both injection and extraction and will be located close to conveyance facilities to be able to deliver the pumped water.

5.5.5 Groundwater Treatment and Concentrate Disposal

Description: As described in the June 2002 draft report, there are a number of alternative treatment methods for demineralization and softening to remove hardness and TDS from the groundwater to improve its quality for delivery to M&I users. Centralized demineralization or softening facilities would result in reduced salt loads to the basin; up to 2,270 tons/year of salt or 6% of the overall salt input.

For the purposes of the GMP Update, it is assumed that up to 7.5 MGD (8,365 AF/yr) of groundwater will require demineralization/softening. This assumes that:

- The M&I demand can be reduced from 11,465 to 10,465 AF/yr in a critically dry year, and that
- 2,100 AF/yr of imported/local surface water is available.

Initial estimates indicate that a demineralization/softening process would require approximately 9.0 MGD (10,100 AF/yr) of 800 mg/l TDS groundwater to be able to deliver 7.5 MGD (8,365 AF/yr) of 500 mg/l TDS water. The remaining 1.5 MGD (1050 gpm, 1,680 AF/yr) would be concentrate, or brine, with 2,600 mg/l of TDS which would require disposal.

Disposal of concentrate from groundwater treatment is a major consideration in groundwater treatment and can be accomplished in several ways. This discussion focuses on evaporation methods which include:

- Fueled evaporation that can be located near the treatment facilities, takes a relatively small area, but will require significant energy resources to implement.
- Land evaporation can be a relatively cost-effective option if a large, inexpensive area of suitable land is available for creation of evaporation ponds.

For either option, it is expected that the remaining salts would be in either a solid form or a highly concentrated brine. Brine solids could easily be trucked out of the basin and disposed of at a landfill or sold to a salt processor. Highly concentrated brines could be conveyed by a tanker truck to the City of Watsonville Wastewater Treatment Plant for discharge through their outfall.

For the purposes of the GMP Update, it is assumed that two to five groundwater demineralization/softening facilities would be required to serve the M&I users efficiently. The groundwater would be extracted from existing wells and the treatment facilities would most likely be located close to existing groundwater wells.

Major Issues: There are several major issues associated with groundwater treatment. The first is that demineralization has high energy costs as compared to development of other water sources. However, the relative energy use and comparative costs of the various water supplies including the true cost of imported CVP water should be developed and evaluated further.

Another major issue associated with groundwater demineralization/softening is the need for concentrate disposal. The concentrate from groundwater treatment would be concentrated prior to disposal so that the remaining concentrate can be easily disposed of. Land evaporation of concentrate from groundwater treatment requires a large land area. It is estimated that up to 300 acres may be required for evaporating 1,250 AF/yr of concentrate alone at an estimated evapotranspiration (ETo) rate of 50"/year (California Irrigation Management Information System database). The additional 12" – 16" of rainfall that falls annually in the area would also need to be accounted for in sizing evaporation ponds.

As discussed in the June 2002 Draft Report, there are several additional options for concentrate disposal that were considered including:

- Export pipeline for concentrate and other waters for disposal such as wastewater effluent, or pumped groundwater for water level management and salt removal. (See Section 8.0 for a description of future studies needed for the export pipeline as a new project element.)

- Deep well injection of concentrate in depths in excess of 1,500 feet that also takes a relatively small area but requires additional permitting and other elements of uncertainty. This alternative for concentrate disposal is probably the least likely option to be used.

Major Benefits: The major benefit of groundwater treatment for M&I use is that it adds a high measure of reliability to the water supply. In addition, use of the local groundwater will be an important part of the effort to manage groundwater levels and quality.

The use of local, treated groundwater will serve to limit the amount of CVP water that is imported. This will assist with the management of groundwater levels and reduce the salt load imported into the basin.

Disposal of concentrate at a sanitary landfill or a salt/mineral company if in a solid form, or to the City of Watsonville ocean outfall if in a concentrated liquid form that meets Watsonville's requirements has the added benefit of removing salts from the groundwater basin.

5.5.6 Groundwater/Surface Water Blending Facilities for Agricultural/M&I Water Users

Description: Blending of high quality imported or local surface water with local groundwater to adjust the TDS of the applied water is one way to achieve overall water quality suitable for agriculture or M&I supply. This type of project is most practical for locations where both sources of groundwater and surface water supplies are readily available.

This Project Toolbox Element would require development of operational criteria on timing, quality, and quantity of deliveries to customers. In addition, the physical facilities that would be required for agricultural users would include some additional piping metering and controls to connect to groundwater wells. Automatic controls could be connected to a telemetry system for remote operation. The facilities could be located on a concrete pad approximately 20' x 20' in size. Additional piping of blended water may be desirable so that the blended and unblended water can be segregated. Facilities for M&I users would be similar but would have to be carefully located so that surface water is filtered before being combined with groundwater.

The system could be operated by using flow meter information from the higher quality water to pace the pumping of groundwater into the pipeline at a rate appropriate for the desired TDS. If the distance from where the water sources are blended to the turnouts are short, a static, in-line mixer could be installed to facilitate full blending.

Since the groundwater quality is poorest in the San Juan sub-basin, it is likely that this Project Toolbox Element will be implemented mostly in the San Juan sub-basin and most likely for agricultural users. A review of the locations of wells and distribution pipelines and use areas would be required to evaluate the most cost-effective locations for blending stations. It is anticipated that no more than 2 – 3 blending stations will be required assuming that locations where groundwater and surface water facilities can be identified that are close together. Other agricultural and M&I blending locations can be developed relatively easily as it becomes practical to do so.

Major Issues: The major issue with groundwater/surface water blending facilities for agricultural water users may be with gaining acceptance by those agricultural users that are currently receiving imported water. The major issue with groundwater/surface water blending facilities for M&I users is locating the facilities so that groundwater is not filtered unnecessarily.

Major Benefits: The major benefits associated with groundwater/surface water blending facilities for agricultural users will be to those users who are currently irrigating with higher TDS groundwater since it will improve the water quality to those users. M&I users would derive the same benefits. In addition, by using less imported surface water, the overall salt input to the groundwater basin will be reduced. By pumping groundwater, this Project Toolbox Element can also function to manage water levels.

5.5.7 Recycled M&I Wastewater Effluent for Direct Reuse

Description: Reuse of recycled effluent from wastewater plants is practiced widely within California. Title 22 recycled water criteria govern the level of treatment and largely determine the acceptable uses for recycled water. Several studies have been conducted regarding the markets for recycled water for direct reuse in San Juan Bautista and Sunnyslope. An evaluation for recycled water use is planned for Hollister. The studies also evaluated the wastewater treatment plant improvements and distribution systems necessary to deliver the recycled water to the potential users.

With regard to the potential supply of recycled water, at the present time there is approximately 3,300 AF/yr of wastewater effluent produced and indirectly reused through percolation in the entire groundwater basin (Water Year 2001 Annual Groundwater Report).

In the San Juan Bautista area, there is far more demand for recycled water than supply (San Juan Bautista Area Water Reclamation Study – Final, May 2002). In the Ridgemark area of the Sunnyslope County Water District service area, there appears to be sufficient demand for recycled water at the Ridgemark golf course to use the estimated 280,000 gpd (0.28 MGD, 314 AF/yr) of recycled water that could be produced. A recent study of recycled water for Ridgemark indicates that there is far more demand for recycled water than supply. (Sunnyslope County Water District – Recycled Water Study, Final- November 2001)

The estimated 2010 wastewater flows to the Hollister domestic wastewater treatment plant is 3.8 MGD (4,200 AF/yr) of average dry weather flow in the peak month. Although a specific recycled water demand analysis has not been prepared, the City of Hollister anticipates conducting a recycled water study in the near future.

Major Issues: The greatest limiting factor on the use of recycled water for direct reuse is the high levels of TDS in the recycled water. For example, the recycled water study for San Juan Bautista assumes a 1:1 blending ratio of imported surface water to recycled water to achieve a 700 mg/l TDS level. The availability of higher quality imported water has reduced the demand for the recycled water. As the quality of the potable water improves, so will the quality of the recycled water that will then improve the marketability of the recycled water.

Implementation of the programs and projects in this GWMP Update will improve the quality of the effluent such that direct reuse may be more practical. However, seasonal fluctuations in the demand for recycled water will require alternative wastewater disposal methods such as percolation and land application of effluent on unirrigated rangelands and other potentially available lands.

The sites that may be appropriate for land application will require consideration of short-term and long-term factors such as water balance; water level; water quality; application methods (such as spray irrigation); percolation; timing of application; proximity to wastewater treatment plants; land-ownership; and necessity for environmental documentation and monitoring.

Another major issue associated with direct reuse of recycled water is the imbalance between when the recycled water would be used, which is the late spring, summer, and early fall, and when most of the recycled water is available, which is in the winter. To be able to maximize the use of recycled water, storage of recycled water and/or land application will be required.

Major Benefits: There are several benefits associated with direct reuse of recycled water which are that it is a beneficial use of a valuable water supply and it provides a disposal mechanism for recycled water, thereby reducing the impact on groundwater levels of effluent percolation.

5.5.8 Tile Drains for Localized Groundwater Level Management

Description: This Project Toolbox Element may be required if agricultural fields contain localized high water levels. As occurs in the San Juan sub-basin, shallow, impermeable clay layers produce localized perched high groundwater in some areas. Tile drains are perforated pipes that are installed above the shallow clay layer to allow the perched groundwater to flow into the perforated pipe, which typically drains to the surface, to a ditch, and possibly to the ocean.

In the northern portions of the Bolsa and Pacheco sub-basins, there are areas where groundwater surfaces near wellheads, creek channels, and faults. This is most likely caused by artesian conditions and/or high water tables. (Groundwater Management Plan for the San Benito County Part of the Gilroy-Hollister Groundwater Basin, 1998). Localized high groundwater conditions also occur in the northern portion of the Hollister East sub-basin. (Water Year 2001 Annual Groundwater Report)

The areas where this Project Toolbox Element will most likely be implemented is in the San Juan sub-basin, where tile drains have already been installed in some areas, and in the Bolsa, Pacheco and northern Hollister East sub-basins. For the most part, tile drains solve a localized problem by moving high groundwater into a ditch or creek, which then percolates into the groundwater, and can create a problem for downstream users.

In the San Juan sub-basin, where the high groundwater levels are most problematic, the SBCWD is initiating a study to develop of a master collection pipeline, as shown on Figure 5-1, to centralize collection of the agriculture drain water. As proposed, the pipeline could terminate in a constructed wetland for polishing that could overflow into the river; as described later in Section 5.5.12.

Major Issues: The major issues associated with the use of tile drains for water level management are the expenses associated with remedying the localized high groundwater condition and the poor quality of the agricultural drainage. It is likely that the water is high in nutrients and TDS, some of which is from the high TDS of the local groundwater, and potentially high in herbicides and/or pesticides.

In addition, if river discharges were to occur, NPDES permits may be required for a point-source discharge from constructed wetlands. Without a master collection pipeline, agricultural discharges are considered non-point sources that are often regulated through best management practices.

Major Benefits: The major benefit associated with the use of tile drains for agricultural effluent collection is that it will result in lower localized groundwater levels, making some land with poor soil drainage and high groundwater levels more viable for agriculture. This can result in the net export of salt, if the agricultural effluent reaches a flowing stream or river.

5.5.9 Tree Belt Evapotranspiration for Localized Groundwater Level Management

Description: This Project Toolbox Element could be used to reduce localized high water levels in agricultural fields. Experimental research in Australia has indicated that high water-use trees such as eucalyptus can use up to 24 inches of water per year and generally lower local water levels. No work has been conducted to translate this water consumption to an AF-per-plant basis. Other high water-consuming vegetation may serve the same purpose. Within the Bay Area, eucalyptus and redwoods have been used on a small scale to take up wastewater effluent.

Similar to the use of tile drains, this Project Toolbox Element could be used in the areas of localized high groundwater described above. It is most likely to be used in conjunction with the constructed wetlands, described in 5.4.21 where trees could be planted with minimal encroachment on agricultural lands.

Major Issues: The major issues associated with this Project Toolbox Element is the highly experimental nature of this approach and the difficulty with quantifying the amount of water that could be removed and the resulting lowering of the water table. In addition, there are concerns with the use of eucalyptus trees, which are not native to the area, for this purpose. Finally, the costs of implementing a program with the accompanying lowering of the water table have not been quantified.

Major Benefits: The major benefit associated with this Project Toolbox Element is that if it can be demonstrated that vegetation is a effective means of managing water levels, the use of vegetation is arguably less intrusive than other more mechanical means of managing local high groundwater levels.

5.5.10 Groundwater Pumping for Water Level Management

Description: This Project Toolbox Element could help manage groundwater levels and salt balances in the San Juan, Pacheco, and northern portion of the Hollister East sub-basins where groundwater levels are particularly high. This Project Toolbox Element would use existing wells to the greatest extent possible. The water from the groundwater basin; depending on the location and quality of the pumped water; could be used in another portion of the sub-basin by using the proposed regional and local conveyance pipeline. Discharge to a surface water such as the San Benito River is possible, but would require obtaining a National Pollutant Discharge Elimination System (NPDES) permit from the Regional Board and compliance with the Program Mitigation Measures found in Section 7.

A groundwater basin-wide water balance that evaluated the amount of groundwater in storage with and without imported surface water indicated from between water years 1990 – 1999, there was an estimated basin-wide increase of groundwater in storage of 11,466 AF/yr. (Groundwater Management Plan: Existing Conditions and Alternatives, December 2001.)

Further analysis of the groundwater budget in the Water Year 2001 Annual Groundwater Report indicates that there was a net increase of about 2,400 AF/yr of groundwater in storage from 2000 - 2001. This net increase of water in storage has occurred even after the percolation of imported surface water by SBCWD was significantly reduced. This net increase is most likely the result of deep percolation of surface water applied for irrigation.

It should be noted that on a sub-basin basis in Water Year 2001, the Pacheco sub-basin was essentially in balance with an estimated net increase of 475 AF/yr in storage; the San Juan sub-basin was also essentially in balance with a net decrease of 11 AF/yr in storage; the Hollister East sub-basin had a net increase of 3,150 AF/yr of groundwater in storage; and the Bolsa sub-basin had a net decrease of 1,896 AF/yr. (Water Year 2001 Annual Groundwater Report). Therefore, the necessity to manage groundwater levels varies widely between sub-basins and is further localized within each sub-basin.

For the purposes of the GMP Update, it is assumed that 2,500 AF/yr of groundwater would need to be removed from the problem areas of the selected sub-basins to manage high groundwater levels. Removal of 2,500 AF/yr would require pumping of 2.25 MGD or 1,560 gallons per minute (gpm) for 365 days a year. At an average production rate of 750 gpm per well, it could take as few as two wells to pump the entire amount. However, more wells at lower pumping rates could be required to effectively remove the groundwater.

Major Issues: There are energy costs associated with pumping groundwater. Groundwater level management may be more cost-effectively achieved by managing the inputs to the groundwater system rather than removing water that has already entered the groundwater system. In addition, any discharge to the Pajaro River would have to be timed to minimize the potential for flooding and impact to important downstream habitat. At some locations, groundwater pumping potentially could impact established wetlands where groundwater is artesian.

Major Benefits: Some of the major benefits of pumping groundwater are that it can help to quickly lower high groundwater levels.

Lower groundwater levels can be beneficial where groundwater interferes with overlying land uses, such as the growth of orchards, operation of septic wastewater systems, creates nuisance conditions from artisian flows, or necessitates the installation and/or operation of subsurface drainage systems. In addition, high groundwater levels can contribute to the potential for liquefaction during seismic events.

5.5.11 Constructed Wetlands Treatment/Polishing of Agricultural Runoff and Stormwater

Description: This Project Toolbox Element includes construction of wetlands for treatment of agricultural runoff and stormwater,. Constructed wetlands have demonstrated capacity to remove sediments and solids that are found in agricultural and stormwater runoff as well as providing for nutrient removal and denitrification of agricultural runoff.

The level of treatment or polishing that can be achieved in a constructed wetlands depends on factors such as the configuration of the ponds and the detention time that is achieved, the hydraulic loading, and the plant species that populate the wetlands.

For the purposes of the GMP Update, it has been assumed that constructed wetlands would be generally developed in areas where there would be minimal negative environmental impacts and where the potential for water quality improvement is great. One proposed area for a constructed wetland is adjacent to the San Benito River as shown on Figure 5-1 where there is an excavation from a gravel mining operation that could be the terminus for an agricultural drainage pipeline. The constructed wetland would offer polishing to potential source waters by removing nutrients, in general, and nitrogen through denitrification if the appropriate species of plants are planted and sufficient detention time can be provided. Another potential area that would offer a similar benefit is in an area to the west of the City of Hollister Domestic Wastewater Treatment Plant.

Major Issues: One of the major issues associated with construction of wetlands is the need to purchase land that is both close to the water source to be treated and of sufficient area to achieve the treatment required. Depending on the level and type of treatment, considerable acreage can be required. In addition, constructed wetlands will percolate water and therefore should not be located in areas of high groundwater or permeability.

The potential concentration of contaminants, such as persistent pesticides and metals in sediment and waters of constructed wetlands and possible effects on wildlife that use the constructed wetlands is a concern of resources agencies.

Major Benefits: Some of the major benefits associated with constructed wetlands are their relatively low construction cost; their low maintenance for treatment and polishing; the seasonal habitat that they provide for migratory birds; and the resulting aesthetic and recreational benefits for the public.

5.5.11.1 Future Study of New Water Management Tools

Description: Several water management issues and possible projects that warrant study in the future have been identified during the preparation of this GMP. These topics of future study are discussed in Section 8.0. The strategies and projects described in Section 8.0 may be studied in the future, but are not currently included as management tools in the GWP Update.

One broad area for future study is the Out-of-Basin Export of wastewater effluent, groundwater treatment concentrate, agricultural drainage runoff, and/or pumped groundwater for salt management. Two different options for Out-of-Basin Export that have been identified for further study are: discharge to the San Benito River or Pajaro River; and an export pipeline to the City of Watsonville's ocean outfall.

Other areas of future study include strategies for disposal of concentrate from groundwater treatment/demineralization and options for percolation and land application of treated wastewater effluent.

Section 6: Plan Implementation

6.1 Basis for Prioritization

The Groundwater Management Plan includes 36 different types of programs and projects for implementation. Some of the programs and projects have been further divided into sub-projects located in different parts of San Benito County. Based on current conditions, some the general locations for sub-projects such as the surface water treatment plants and pipeline segments have been identified while locations for others may not be identified for several years.

In order to implement the programs, projects and sub-projects, the 36 programs/projects have been placed into four categories as follows:

1. **Ongoing:** Programs/Projects that are currently in place that will need to be maintained and may require enhancement/modification
2. **High Priority:** Programs/Projects that most benefit the current Water Resource Associations members and/or are of relatively low complexity such that the project can be implemented within 3 – 5 years (i.e. by 2007)
3. **Medium Priority:** Programs/Projects that are of a moderate benefit to the current WRA members and/or are of moderate complexity such that the project can be implemented within 6 – 10 years (i.e. by 2012)
4. **Low Priority:** Programs/Projects that may be a more general benefit to San Benito County and/or are of a high complexity such that the project can be implemented within 11 – 20 years (i.e. by 2022).

The categorization of the programs/projects is based primarily on the steps that are necessary to implement the program/project which is also a function of the size and complexity of the program/project. Typical project timelines are discussed in more detail later in Section 6.2.

Those programs/projects that are smaller, less complex, and less controversial are more likely to be implemented in a shorter time frame than those that are larger, are more complex, and require more planning prior to implementation.

6.2 Typical Project Timelines

As indicated above, programs/projects can be categorized into smaller, less complex projects and larger, more complex projects. An example of a smaller, less complex project might be a groundwater/surface water blending station or development of the Cienega groundwater or Arroyo Dos Picachos surface water source.

An example of a larger, more complex project might be the development of the Pacheco Creek local water supply or an effluent/concentrate/groundwater pumping/agricultural drainage discharge pipeline. The following Tables 6-1 and 6-2 present a comparison of the relative

timeframes for implementation of the two types of projects and the steps that may be required for implementation.

Table 6-1: Small Project Implementation Schedule

Arroyo Dos Picachos Water Supply Development Example

Task	Estimated Time for Completion
Conceptual Planning/Feasibility Study	9 months – 1 year
Water Rights Acquisition	2 years
Environmental Documentation (CEQA/NEPA)/Permitting	1 year – 15 months
Pre-Design/Design	6 months
Construction	3 months
Total Elapsed Time (Some tasks may overlap)	**4 – 5 years**

Table 6-2: Large Project Implementation Schedule

Pacheco Creek Water Supply Development Example

Task	Estimated Time for Completion
Conceptual Planning	6 - 9 months
Feasibility Study	6 – 9 months
Environmental Documentation (CEQA/NEPA)	12 – 24 months
Negotiation with Other Agencies	12 – 24 months
Water Rights	3 years
Permitting	12 – 18 months
Pre-Design	6 months
Design	12 months
Construction	9 months
Total Elapsed Time (Some tasks may overlap)	**10 -12 years**

6.3 Projects and Priorities

Using the list of 36 programs and projects and the basis for prioritization above, the following tables have been developed. Table 6–3 shows the programs and projects in order presented in Section 5, while Table 6-4 shows the programs and projects in order of priority.

The priorities are based on the facts and circumstances that were available at the time of the GMP Update and are expected to be reviewed and revised during future updates to the GMP.

Table 6-3: Groundwater Management Plan Programs and Projects in Section 5 Order

Priority	Project Toolbox Elements
Institutional Programs	
A- On-going	M&I Water Conservation
A- On-going	Agricultural Water Conservation
A- On-going	Salinity Education Program
B- High Priority	Water Softener Ordinance
A- On-going	Industrial Salt Control in Municipal Wastewater Program
A- On-going	Nitrate Education Program
B- High Priority	Well Construction and Abandonment Ordinance
A- On-going	Maintain and Enhance Strategic Data Collection and Management Program
A- On-going	Continue and Expand Economic/Regulatory Water Level Management Tools
Continuation of Existing Projects Activities	
A- On-going	Existing Groundwater Extraction Facilities
A- On-going	Surface Water Importation
A- On-going	Surface Water Treatment Site A - Lessalt - 3 MGD
B- High Priority	Surface Water Treatment Site B - San Juan Bautista - 1 MGD
C- Medium Priority	Surface Water Treatment Site C - Location not determined at this time – Estimated Capacity 2 MGD
C- Medium Priority	Surface Water Treatment Site D - Location not determined at this time – Estimated Capacity 1.3 MGD
D- Low Priority	Surface Water Treatment Site E - Location not determined at this time – Estimated Capacity 1.2 MGD
A- On-going	M&I Wastewater Effluent Percolation
A- On-going	Water Transfers
A- On-going	In-Basin Water Banking - Natural Direct Percolation[1]
A- On-going	In-Basin Water Banking - Artificial Percolation of Imported and/or Local Surface Water[1] - San Benito River Wellfield
A- On-going	In-Basin Water Banking - In-lieu Banking of Imported and/or Local Surface Water[1]
New Projects/Activities	
B- High Priority	Development/Improvement of High Quality Local Ground and Surface Water Supplies – Cienega
B- High Priority	Development/Improvement of High Quality Local Ground and Surface Water Supplies - Pacheco/Northern Hollister East Sub-basins Groundwater Pumping

Table 6-3: Groundwater Management Plan Programs and Projects in Section 5 Order

Priority	Project Toolbox Elements
New Projects/Activities (cont.)	
B- High Priority	Development/Improvement of High Quality Local Ground and Surface Water Supplies - Arroyo Dos Picachos
D- Low Priority	Development/Improvement of High Quality Local Ground and Surface Water Supplies - Pacheco Creek
D- Low Priority	Development/Improvement of High Quality Local Ground and Surface Water Supplies - Arroyo Las Viboras
B- High Priority	Regional and Local Conveyance Facilities for Multiple Water Supply Distribution - Pipeline Segment A
B- High Priority	Regional and Local Conveyance Facilities for Multiple Water Supply Distribution - Pipeline Segment B
C- Medium Priority	Regional and Local Conveyance Facilities for Multiple Water Supply Distribution - Pipeline Segment C
C- Medium Priority	Regional and Local Conveyance Facilities for Multiple Water Supply Distribution - Pipeline Segment D
D- Low Priority	Regional and Local Conveyance Facilities for Multiple Water Supply Distribution - Pipeline Segment E
B- High Priority	Out-of-Basin Water Banking
C- Medium Priority	In-Basin Water Banking - Aquifer Storage and Recovery of Imported and/or Local Surface Water
B- High Priority	Groundwater Treatment and Concentrate Disposal Site A - Hollister/Sunnyslope Area
B- High Priority	Groundwater Treatment and Concentrate Disposal Site B - Hollister/Sunnyslope Area
D- Low Priority	Groundwater Treatment and Concentrate Disposal Site C - Location not determined at this time
D- Low Priority	Groundwater Treatment and Concentrate Disposal Site D - Location not determined at this time
D- Low Priority	Groundwater Treatment and Concentrate Disposal Site E - Location not determined at this time
B- High Priority	Groundwater/Surface Water Blending w/ Pipeline A and B
B- High Priority	Recycled M&I Wastewater Effluent for Direct Reuse - SJB Recycled M&I Wastewater Effluent Project
C- Medium Priority	Recycled M&I Wastewater Effluent for Direct Reuse - Sunnyslope Ridgemark
C- Medium Priority	Recycled M&I Wastewater Effluent for Direct Reuse - Hollister Domestic
C- Medium Priority	Recycled M&I Wastewater Effluent for Direct Reuse - Hollister Industrial
B- High Priority	Tile Drains for Localized Groundwater Level Management
B- High Priority	Tree Belt Evapotranspiration for Localized Groundwater Level Management
B- High Priority	Groundwater Pumping for Water Level/Water Quality Management
B- High Priority	Constructed Wetlands for Treatment/Polishing of Stormwater/Agricultural Runoff

(1) Also applies to New Projects/Activities for Local Surface Water

Table 6-4: Groundwater Management Plan Programs and Projects in Priority Order

Priority	Program Type	Project Toolbox Elements
A - On-going	Institutional	M&I Water Conservation
A - On-going	Institutional	Agricultural Water Conservation
A - On-going	Institutional	Salinity Education Program
A - On-going	Institutional	Industrial Salt Control in Municipal Wastewater Program
A - On-going	Institutional	Nitrate Education Program
A - On-going	Institutional	Maintain and Enhance Strategic Data Collection and Management Program
A - On-going	Institutional	Continue and Expand Economic/Regulatory Water Level Management Tools
A - On-going	Existing	Existing Groundwater Extraction Facilities
A - On-going	Existing	Surface Water Importation
A - On-going	Existing	Surface Water Treatment Site A – Lessalt – 3 MGD
A - On-going	Existing	M&I Wastewater Effluent Percolation
A - On-going	Existing	Water Transfers
A - On-going	Existing	In-Basin Water Banking - Natural Direct Percolation[1]
A - On-going	Existing	In-Basin Water Banking - Artificial Percolation of Imported and/or Local Surface Water[1] - San Benito River Wellfield
A - On-going	Existing	In-Basin Water Banking - In-lieu Banking of Imported and/or Local Surface Water[1]
B - High Priority	Institutional	Water Softener Ordinance
B - High Priority	Institutional	Well Construction and Abandonment Ordinance
B - High Priority	Existing	Surface Water Treatment Site B - San Juan Bautista – 1 MGD
B - High Priority	New	Development/Improvement of High Quality Local Ground and Surface Water Supplies – Cienega
B - High Priority	New	Development/Improvement of High Quality Local Ground and Surface Water Supplies - Pacheco/Northern Hollister East Sub-basins Groundwater Pumping
B - High Priority	New	Development/Improvement of High Quality Local Ground and Surface Water Supplies - Arroyo Dos Picachos
B - High Priority	New	Regional and Local Conveyance Facilities for Multiple Water Supply Distribution - Pipeline Segment A
B - High Priority	New	Regional and Local Conveyance Facilities for Multiple Water Supply Distribution - Pipeline Segment B

Table 6-4: Groundwater Management Plan Programs and Projects in Priority Order

Priority	Program Type	Project Toolbox Elements
B - High Priority	New	Out-of-Basin Water Banking
B - High Priority	New	Groundwater Treatment and Concentrate Disposal Site A - Hollister/Sunnyslope Area
B - High Priority	New	Groundwater Treatment and Concentrate Disposal Site B - Hollister/Sunnyslope Area
B - High Priority	New	Groundwater/Surface Water Blending w/ Pipeline A and B
B - High Priority	New	Recycled M&I Wastewater Effluent for Direct Reuse - SJB Recycled M&I Wastewater Effluent Project
B - High Priority	New	Tile Drains for Localized Groundwater Level Management
B - High Priority	New	Tree Belt Evapotranspiration for Localized Groundwater Level Management
B - High Priority	New	Groundwater Pumping for Water Level Management
B - High Priority	New	Constructed Wetlands for Treatment/Polishing of Stormwater/Agricultural Runoff
C - Medium Priority	Existing	Surface Water Treatment Site C - Location not determined at this time – Expected Capacity 2 MGD
C - Medium Priority	Existing	Surface Water Treatment Site D - Location not determined at this time – Expected Capacity 1.8 MGD
C - Medium Priority	New	Regional and Local Conveyance Facilities for Multiple Water Supply Distribution - Pipeline Segment C
C - Medium Priority	New	Regional and Local Conveyance Facilities for Multiple Water Supply Distribution - Pipeline Segment D
C - Medium Priority	New	In-Basin Water Banking - Aquifer Storage and Recovery of Imported and/or local Surface Water
C - Medium Priority	New	Recycled M&I Wastewater Effluent for Direct Reuse - Sunnyslope Ridgemark
C - Medium Priority	New	Recycled M&I Wastewater Effluent for Direct Reuse - Hollister Domestic
C - Medium Priority	New	Recycled M&I Wastewater Effluent for Direct Reuse - Hollister Industrial
D - Low Priority	Existing	Surface Water Treatment Site E - Location not determined at this time
D - Low Priority	New	Development/Improvement of High Quality Local Ground and Surface Water Supplies - Pacheco Creek
D- Low Priority	New	Development/Improvement of High Quality Local Ground and Surface Water Supplies - Arroyo Las Viboras
D- Low Priority	New	Regional and Local Conveyance Facilities for Multiple Water Supply Distribution - Pipeline Segment E

Table 6-4: Groundwater Management Plan Programs and Projects in Priority Order

Priority	Program Type	Project Toolbox Elements
D- Low Priority	New	Groundwater Treatment and Concentrate Disposal Site C - Location not determined at this time
D- Low Priority	New	Groundwater Treatment and Concentrate Disposal Site D - Location not determined at this time
D- Low Priority	New	Groundwater Treatment and Concentrate Disposal Site E - Location not determined at this time

(a) [1] Also applies to New Projects/Activities for Local Surface Water

6.4 Project Cost Estimation Method

Very preliminary, conceptual-level cost estimates are provided for those infrastructure programs/projects/sub-projects that have been sufficiently defined at this time. However, not all facilities required to implement this plan have been identified, sized, or costed at this time. These other facilities include: pump stations for pipelines, and new wells, including pumping facilities and local conveyance pipelines.

As defined by the American Association of Cost Engineers, conceptual level (order of magnitude) estimates typically have an accuracy of plus 50% to minus 30%. For those projects for which studies have been conducted, cost estimates have been provided.

Costs for on-going programs and projects are indicated with 'Not Applicable" while those projects where there is insufficient information, or where information is in the process of being developed, the costs are indicated with "Not Available". A summary of the costs that have been developed is provided in Section 6.5.

These conceptual level probable costs of capital, operations and maintenance provided a starting point for evaluating funding needs. More detailed costs of capital and operations and maintenance should be prepared as more project details become known.

6.4.1 Capital Cost Components

The capital costs of the sub-projects have been grouped into broad categories of project construction, engineering and management, land acquisition, and specialty costs. The cost components for capital cost are as follows:

6.4.1.1 Project Construction Costs

The project construction cost includes the capital cost of constructing the project The construction costs will be based on cost curves and typical "rules of thumb", such as unit cost per gallon capacity for tanks or treatment plants, cost per diameter-inch/lineal foot for pipelines, cost per Acre-foot of water for reservoir projects, and are assumed to include contractor overhead and profit and contingency. etc.

6.4.1.2 Engineering, Construction Management Costs

These costs include the engineering design, construction management, administrative, legal, and simple environmental documentation (negative declarations) costs. This cost component is estimated at twenty-five percent of the construction cost.

6.4.1.3 Land Acquisition / Right-of-Way Acquisition Costs

This cost includes buying land and access to specific areas. For this conceptual level work, the cost of land will be based on a cost per acre for an urban or rural area. Urban Land is assumed to cost $100,000 per acre, smaller tracts of rural land is assumed to cost $10,000 per acre while larger tracts are assumed to cost $1,500 per acre.

These land costs have been corroborated with review of commercial land costs available on the Multiple Listings Service for San Benito County.

6.4.1.4 Special Environmental Documentation and Site Consideration Costs

This cost component includes preparing more detailed Environmental Impact Reports for special project circumstances such as work in a riparian corridor. This cost also accounts for any special site or location costs. Since these costs are project and site-specific, the project team will develop the cost on a per-project basis.

6.4.2 Annual O&M Cost Components

The annual O&M costs of the projects have been grouped into broad categories of water purchase cost, power cost, chemical cost, personnel cost and specialty costs. Not all O&M cost components will be applicable to each sub-project. Where other reports estimated annual O&M costs, those O&M costs were used. The general cost components for O&M include:

6.4.2.1 Water Purchase Costs

The cost of purchasing water for agricultural use or municipal treatment will be based on current and or foreseeable future water costs.

6.4.2.2 Power Costs

The cost of power for the project will be based on the kilowatts per unit of capacity required for pumping, desalting, etc. The systems will be assumed to operate year round. The cost of power is assumed to be $0.15 per kilowatt-hr.

6.4.2.3 Facility Maintenance Costs

Costs for maintenance for the sub-projects will be calculated as a percentage of the construction capital cost. The annual O&M cost will be estimated as a percentage of the construction cost as follows: 2% for treatment facilities, 1% of well facilities, 0.05% for pipelines, storage reservoirs, etc.

6.4.2.4 Chemical Costs

This cost will include the chemicals necessary for water treatment. The cost will be based on a unit cost per capacity of the specific sub-project.

6.4.2.5 Personnel Costs

The cost will be determined as a salary of $50,000 per year (including benefits) per person times the number of people necessary for the sub-project.

6.4.2.6 Specialty Costs

These costs are unique to the specific projects, such as membrane replacement for a water treatment plant, or special monitoring costs for discharge of agricultural runoff from constructed wetlands to the San Benito River.

6.4.2.7 Present Worth of 20-year Annual O&M Cost

The present worth of the annual O&M Costs has been calculated for 20-years using a 6% interest rate. The 6% interest rate is consistent with the rate that California Department of Water Resources uses in its Proposition 13 Grant Applications.

6.4.3 Capital Costs in the Future

Since many of the projects may not be constructed for many years in the future, the impact of inflation on capital costs has been calculated by estimating the capital costs 5 years in the future in 2007, 10 years in the future in 2012, and 20 years in the future in 2022. An inflation rate of 2.5% has been used to escalate the costs.

6.5 Estimated Costs of Implementation

Using the method of estimating costs described in Section 6.4 above, estimates of the probable cost of construction on a planning basis have been developed for the projects and sub-projects. The cost tables have been divided using the prioritization developed in Section 6.3 above and are presented in summary below.

6.5.1 On-Going Programs/Projects

Programs/projects that are on-going are shown in Table 6-5 as follows.

Table 6-5: Ongoing Programs/Projects

Program Type	Project Toolbox Elements	2002 Capital Costs	20-Year O&M Costs (2002 $)	2007 Capital Costs	2012 Capital Costs	2022 Capital Costs	Notes
Institutional	M&I Water Conservation	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Current WRA Program
Institutional	Agricultural Water Conservation	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Current SBCWD Program
Institutional	Salinity Education Program	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Current SBCWD Program
Institutional	Industrial Salt Control in Municipal Wastewater Program	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Current SBCWD Program
Institutional	Nitrate Education Program	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Current SBCWD Program
Institutional	Maintain and Enhance Strategic Data Collection and Management Program	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Current SBCWD Program
Institutional	Continue and Expand Economic/Regulatory Water Level Management Tools	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Current SBCWD Program
Existing	Existing Groundwater Extraction Facilities	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
Existing	Surface Water Importation	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
Existing	Surface Water Treatment Site A - Lessalt - 3 MGD	$4,300,000	$10,552,400	Not Applicable	Not Applicable	Not Applicable	Capital Cost Based on 95% Cost Estimate, In Operation November 2002, O&M Costs Estimated

Table 6-5: Ongoing Programs/Projects

Program Type	Project Toolbox Elements	2002 Capital Costs	20-Year O&M Costs (2002 $)	2007 Capital Costs	2012 Capital Costs	2022 Capital Costs	Notes
Existing	M&I Effluent Percolation	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
Existing	Water Transfers	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
Existing	In-Basin Water Banking - Natural Direct Percolation	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	
Existing	In-Basin Water Banking - In-lieu Banking of Imported and/or Local Surface SWater	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Not Applicable	Additional In-lieu Banking Will Require Additional Pipeline Facilities.

6.5.2 High Priority Programs/ Projects: 3 – 5 Years to Implementation

Estimated probable costs for construction and operations and maintenance for High Priority programs/projects that are expected to be implemented within a 3-5 year timeframe are shown in Table 6-6 as follows.

Table 6-6: High Priority Programs/Projects: 3-5 Years to Implementation

Program Type	Project Toolbox Elements	2002 Capital Costs	20-Year O&M Costs (2002$)	2007 Capital Costs	2012 Capital Costs	2022 Capital Costs	Notes
Existing	In-Basin Water Banking - Artificial Percolation of Imported and/or Local Surface Water1 - San Benito River Wellfield	Not Available	Not Available	Not Available	Not Available	Not Available	Under Study by SBCWD in 2002 - 2003
Institutional	Water Softener Ordinance	Not Available	Not Applicable	Not Available	Not Available	Not Available	Will Require WRA and County Approval
Institutional	Well Construction and Abandonment Ordinance	Not Available	Not Applicable	Not Available	Not Available	Not Available	Under Development by SBCWD
Existing	Surface Water Treatment Site B - San Juan Bautista - 1 MGD	$1,600,000	$4,014,500	$1,800,000	$2,000,000	$2,600,000	
New	Development/Improvement of High Quality Local Ground and Surface Water Supplies - Cienega	$2,900,000	$344,100	$3,300,000	$3,700,000	$4,800,000	From 1983 Walters Engineering Report
New	Development/Improvement of High Quality Local Ground and Surface Water Supplies - Pacheco/Northern Hollister East Sub-basins Groundwater Pumping	Not Available	Not Available	Not Available	Not Available	Not Available	Under Study by SBCWD in 2002 - 2003
New	Development/Improvement of High Quality Local Ground and Surface Water Supplies - Arroyo Dos Picachos	$4,500,000	$802,900	$5,100,000	$5,800,000	$7,400,000	Assumed to be 40-foot Long Inflatable Diversion Dam, Includes Pump Station
New	Regional and Local Conveyance Facilities for Multiple Water Supply Distribution - Pipeline Segment A	$4,800,000	$114,700	$5,400,000	$6,100,000	$7,900,000	Estimated Length -3.7 Miles Conveyance and 1.6 Miles Collection Pipeline

Table 6-6: High Priority Programs/Projects: 3-5 Years to Implementation

Program Type	Project Toolbox Elements	2002 Capital Costs	20-Year O&M Costs (2002$)	2007 Capital Costs	2012 Capital Costs	2022 Capital Costs	Notes
New	Regional and Local Conveyance Facilities for Multiple Water Supply Distribution - Pipeline Segment B	$2,100,000	$114,700	$2,400,000	$2,700,000	$3,400,000	Estimated Length -2.2 Miles Conveyance and 0.24 Miles Collection Pipeline
New	Out-of-Basin Water Banking	Not Available	Not Available	Not Available	Not Available	Not Available	
New	Groundwater Treatment and Concentrate Disposal Site A - Hollister/Sunnyslope Area	$5,800,000	$5,505,600	$6,600,000	$7,400,000	$9,500,000	Estimated Capacity 2.5 MGD. Costs Estimated Assuming Concentrate Disposal through an Export Pipeline. Costs for Alternate Concentrate Disposal will be Equal to or Greater than the Costs Estimated.
New	Groundwater Treatment and Concentrate Disposal Site B - Hollister/Sunnyslope Area	$5,800,000	$5,505,600	$6,600,000	$7,400,000	$9,500,000	Estimated Capacity 2.5 MGD. Costs estimated assuming concentrate disposal through an export pipeline. Costs for alternate concentrate disposal will be equal to or greater than the costs estimated.
New	Groundwater/Surface Water Blending w/ Pipeline A and B	$180,000	$206,460	$204,000	$230,000	$295,000	Assumed 6 Stations Constructed
New	Recycled M&I Effluent for Direct Reuse - SJB Recycled M&I Effluent Project	$6,200,000	Not Provided	$7,000,000	$7,900,000	$10,200,000	Most Expensive Alternative 2 Selected for Inclusion from SJB Recycled Water Study
New	Tile Drains for Localized Groundwater Level Management	Not Available	Not Available	Not Available	Not Available	Not Available	Under Study by SBCWD in 2002 - 2003
New	Tree Belt Evapotranspiration for Localized Groundwater Level Management	Not Available	Not Available	Not Available	Not Available	Not Available	

Table 6-6: High Priority Programs/Projects: 3-5 Years to Implementation

Program Type	Project Toolbox Elements	2002 Capital Costs	20-Year O&M Costs (2002$)	2007 Capital Costs	2012 Capital Costs	2022 Capital Costs	Notes
New	Groundwater Pumping for Water Level Management	Not Applicable	Not Available	Not Applicable	Not Applicable	Not Applicable	Implementation Expected Through Existing Facilities
New	Constructed Wetlands for Treatment/Polishing of Stormwater/Agricultural Runoff	$1,900,000	$802,900	$2,100,000	$2,400,000	$3,100,000	For 11 Acre Wetlands for Municipal Polishing
Subtotal	High Priority Projects with Estimates	$15,799,000	$6,079,100	$17,700,000	$20,000,000	$25,800,000	

6.5.3 Medium Priority Programs/Projects: 6 – 10 Years to Implementation

Estimated probable costs for construction and operations and maintenance for Medium Priority programs/projects that are expected to be implemented within a 6-10 year timeframe are shown in Table 6-7 as follows.

Table 6-7: Medium Priority Programs/Projects: 6-10 Years to Implementation

Program Type	Project Toolbox Elements	2002 Capital Costs	20-Year O&M Costs (2002$)	2007 Capital Costs	2012 Capital Costs	2022 Capital Costs	Notes
Existing	Surface Water Treatment Site C - Location not determined at this time	$3,100,000	$6,996,700	$3,500,000	$4,000,000	$5,100,000	Estimated Capacity 2 MGD
Existing	Surface Water Treatment Site D - Location not determined at this time	$4,500,000	$10,093,600	$5,100,000	$5,800,000	$7,400,000	Estimated Capacity 3 MGD
New	Regional and Local Conveyance Facilities for Multiple Water Supply Distribution - Pipeline Segment C	$4,100,000	$114,700	$4,600,000	$5,200,000	$6,700,000	Estimated Length -5.5 Miles
New	Regional and Local Conveyance Facilities for Multiple Water Supply Distribution - Pipeline Segment D	$3,100,000	$114,700	$3,500,000	$4,000,000	$5,100,000	Estimated Length -3.5 Miles
New	In-Basin Water Banking - Aquifer Storage and Recovery of Imported and/or Local Surface Water	Not Available	Not Available	Not Available	Not Available	Not Available	
New	Recycled M&I Effluent for Direct Reuse - Sunnyslope Ridgemark	$4,600,000	$2,294,000	$5,200,000	$5,900,000	$7,500,000	Based on Most Expensive Alternative from SCWD Recycled Water Study - Golf Course w/ Storage
New	Recycled M&I Effluent for Direct Reuse - Hollister Domestic	$21,700,000	$14,222,800	$24,600,000	$27,800,000	$35,600,000	Based on Most Expensive Alternative from HSE May 2002 Report

Table 6-7: Medium Priority Programs/Projects: 6-10 Years to Implementation

Program Type	Project Toolbox Elements	2002 Capital Costs	20-Year O&M Costs (2002$)	2007 Capital Costs	2012 Capital Costs	2022 Capital Costs	Notes
New	Recycled M&I Effluent for Direct Reuse - Hollister Industrial	Not Available	Not Available	Not Available	Not Available	Not Available	
Subtotal -	Medium Priority Projects with Estimates	$41,100,000	$33,836,500	$46,500,000	$52,700,000	$67,400,000	
							Capital Cost Based on 95% Cost Estimate, In Operation November 2002

6.5.4 Low Priority Programs/Projects -11 – 20 Years to Implementation

Estimated probable costs for construction and operations and maintenance for Low Priority programs/projects that are expected to be implemented within a 11-20 year timeframe are shown in Table 6-8 as follows.

Table 6-8: Low Priority Programs/Projects: 11 to 20 Years to Implementation

Program Type	Project Toolbox Elements	2002 Capital Costs	20-Year O&M Costs (2002 $)	2007 Capital Costs	2012 Capital Costs	2022 Capital Costs	Notes
Existing	Surface Water Treatment Site E - Location not determined at this time	$1,900,000	$4,588,000	$2,100,000	$2,400,000	$3,100,000	Estimated Capacity 1.2 MGD
New	Development/Improvement of High Quality Local Ground and Surface Water Supplies - Pacheco Creek	$5,000,000	$802,900	$5,700,000	$6,400,000	$8,200,000	Assumed to be 75-foot Long Inflatable Diversion Dam, Includes Pump Station
New	Development/Improvement of High Quality Local Ground and Surface Water Supplies - Arroyo Las Viboras	$4,500,000	$802,900	$5,100,000	$5,800,000	$7,400,000	Assumed to be 40-foot Long Inflatable Diversion Dam, Includes Pump Station
New	Regional and Local Conveyance Facilities for Multiple Water Supply Distribution - Pipeline Segment E	$5,100,000	$114,700	$5,800,000	$6,500,000	$8,400,000	Estimated Length -6.1 Miles, Necessary for In-lieu Banking in Bolsa
New	Groundwater Treatment and Concentrate Disposal Site C - Location not determined at this time	$5,800,000	$5,505,600	$6,600,000	$7,400,000	$9,500,000	Estimated Capacity 2.5 MGD, Concentrate Disposal through Export Pipeline

Table 6-8: Low Priority Programs/Projects: 11 to 20 Years to Implementation

Program Type	Project Toolbox Elements	2002 Capital Costs	20-Year O&M Costs (2002 $)	2007 Capital Costs	2012 Capital Costs	2022 Capital Costs	Notes
New	Groundwater Treatment and Concentrate Disposal Site D - Location not determined at this time	Not Available	Not Available	Not Available	Not Available	Not Available	Location May Not Be Required
New	Groundwater Treatment and Concentrate Disposal Site E - Location not determined at this time	Not Available	Not Available	Not Available	Not Available	Not Available	Location May Not Be Required
Subtotal	Low Priority Projects with Estimates	$22,300,000	$11,814,100	$25,300,000	$28,500,000	$36,600,000	*Capital Cost Based on 95% Cost Estimate, In Operation November 2002

6.5.5 Cost Summary

Table 6-9 below is a summary of all of the projects with estimates. The Lessalt Surface Water Treatment Plant is not included in this summary because the project has been completed.

Table 6-9: Summary of Costs for Programs/Projects With Estimates

	2002 Capital Costs	20-Year O&M Costs (2002 $)	2007 Capital Costs	2012 Capital Costs	2022 Capital Costs
Subtotal - High Priority Projects with Estimates	$60,580,000	$19,246,660	$68,604,000	$77,330,000	$99,395,000
Subtotal - Medium Priority Projects with Estimates	$41,100,000	$33,836,500	$46,500,000	$52,700,000	$67,400,000
Subtotal - Low Priority Projects with Estimates	$22,300,000	$11,814,100	$25,300,000	$28,500,000	$36,600,000
Total - All Projects with Estimates	**$123,980,000**	**$64,897,260**	**$140,404,000**	**$158,530,000**	**$203,395,000**

Section 7: Program-Level Mitigation Measures for the GMP Update

Future projects implemented under the GWMP Update will incorporate the following program mitigation measures, as appropriate, to avoid or reduce potentially significant environmental impacts.

7.1 Air Quality

7.1.1 Dust Control Program

Prior to construction of evaporation ponds for groundwater treatment concentrate, an effective dust control program will be developed.

7.2 Biological Resources

7.2.1 Construction Impacts to Wetland Habitats

7.2.1.1 Avoidance and Minimization.

New projects will be designed, constructed, and operated in such a way as to avoid and/or minimize impacts to wetland habitats. If total avoidance is not possible, then wetland replacement will be completed.

7.2.1.2 Wetland Replacement.

The wetland habitat that will be lost under any new projects would be functionally replaced in conformance with mitigation requirements of the responsible regulatory agencies. In-kind (the same wetland type) and on-site replacement of lost wetland habitats will be done where possible.

The determination of wetland impacts and the subsequent location and design of potential mitigation sites would be determined by qualified biologists in coordination with resource agency personnel. Mitigation and habitat restoration plans would provide for the following:

a. Calculation and replacement of lost acreage and functions of wetland habitat

b. Location of restoration opportunities, complete with an analysis of the technical approach to create high quality wetlands.

c. Detailed plans will be prepared for wetland mitigation construction that includes excavation elevations, location of hydrologic connections, planting plans and soil amendments, if necessary. Maintenance and monitoring plans are to be prepared in consultation with a qualified habitat restoration specialist. Any mitigation wetlands will be monitored for a period of five years, during which the site will achieve the target jurisdictional acreage by Year 5. Specific performance criteria will be

determined and monitored for site success. Monitoring reports will be provided annually to the appropriate resource agencies.

d. *Permits.* Prior to construction of any project element that may impact wetland habitats, the project proponent will apply for a Section 404 permit and Water Quality Certification from the U.S. Army Corps of Engineers and the Regional Water Quality Control Board. The project proponent will comply with the conditions of required permits.

7.2.2 Construction Impacts to Riparian Habitats

7.2.2.1 Avoidance and Minimization.

New projects will be designed, constructed, and operated in such a way as to avoid and/or minimize impacts to riparian habitats. If avoidance is not possible, then riparian habitat replacement will be required.

7.2.2.2 Riparian Habitat Replacement.

Permanent impacts to vegetation within riparian habitats are typically mitigated at ratios based on the quality of the habitat to be impacted. Due to the complex mosaic of habitats often found within riparian corridors, impacts are typically assessed based on three habitat quality categories, described below. This methodology ensures that, regardless of the type of habitat impacted, its relative value and time required to reestablish replacement habitat is taken into account in quantifying impacts and necessary mitigation. As a result, the impact quantities are not calculated by habitat type, but rather by habitat quality category.

The three habitat quality categories are:

High quality – Native overstory with continuous understory or occurring in dense thickets; dense native overstory with sparse, non-native or no understory; and native willow thicket.

Medium quality – Sparse native overstory with sparse, non-native or no understory, non-native overstory with native understory, and dense non-native overstory with sparse, non-native or no understory.

Lower quality – Sparse non-native overstory with sparse, non-native or no understory. In addition, any areas not included in medium or high quality categories that will be covered with riprap, gabions, etc. (e.g., ruderal habitat and bare ground).

Mitigation ratios of 3:1, 2:1, and 1:1 (replacement acres:lost acres) will generally be applied for impacts to high, medium and low-quality habitats, respectively.

The assessment of riparian impacts and the subsequent location and design of potential mitigation sites will be determined by qualified biologists in coordination with resource agency personnel. These plans will include the following:

a. A description of how the restoration will replace the lost acreage, functions, and values of riparian habitat.

b. Site specific restoration design with a complete analysis of the technical approach to create high quality riparian habitat. The design will include an implementation plan that details site grading, soil amendments, irrigation, planting list, floodplain connectivity, geomorphic conditions and anticipated wildlife use. Revegetation should use native species with seeds or cuttings collected on-site or locally. The restoration plan will also include an explanation of all required site maintenance. A monitoring plan will be developed that includes success criteria for all riparian plantings.

7.2.2.3 Consolidation of Riparian Mitigation.

If multiple smaller impact areas occur, it would be beneficial to consolidate mitigation into a larger habitat restoration area. Larger riparian restoration areas would provide greater functions and values than numerous small mitigation sites. The location and design of potential mitigation sites will be determined by qualified restoration biologists in coordination with resource agency personnel.

7.2.2.4 Encroachment Into Riparian Buffer Zones.

If a new project element would be located within 100 feet of the edge of a riparian corridor, and has encroachment impacts, mitigation in the form of habitat replacement or a functional equivalent will be completed. Mitigation ratios will be determined by a qualified biologist and will be based upon the type of development proposed and the quality and extent of indirect impacts to the riparian habitat.

7.2.2.5 Permits

Prior to construction within the bed and banks of creeks, rivers, or lakes, the project proponent will apply for and obtain a Streambed Alteration Agreement from the California Department of Fish and Game.

7.2.3 Construction Impacts to Aquatic Habitat and Species

7.2.3.1 Implementation of Best Management Practices For Work in Stream Channels.

Implementation of Best Management Practices described below will reduce potential impacts to aquatic species to a less-than-significant level. The following recommendations by the California Department of Fish and Game must be followed, regardless of whether any watercourse within project element footprints are dewatered or not, in order to comply with proper mitigation measures:

a. No equipment will be operated in the live stream channel.

b. When work in a flowing stream is unavoidable, any stream flow shall be diverted around the work area by a barrier, temporary culvert or a new channel capable of permitting upstream and downstream fish movement.

c. Construction of the barrier or the new channel shall normally begin in the downstream area and continue in an upstream direction and the flow shall be diverted only when construction of the diversion is completed.

d. No debris, soil, silt, sand, bark, slash, sawdust, cement, concrete, washings, petroleum products or other organic or earthen material shall be allowed to enter into or be placed where it may be washed by rainfall or runoff into waters of the State.

7.2.4 Potential Construction Impacts to Hairless Popcorn-flower

7.2.4.1 Determine Presence/Absence.

Before implementing any new project elements that could impact vernal marsh habitats within the Bolsa, Pacheco and Hollister East Subbasins, blooming season surveys for the hairless popcorn-flower will be completed. Between March and May prior to construction, areas to be impacted within the Bolsa, Pacheco and Hollister East Subbasin will be surveyed for hairless popcorn flower. If the surveys are negative, no further mitigation is warranted. If hairless popcorn flower populations are found in the construction area, avoidance will be necessary.

7.2.4.2 Avoidance.

Project element(s) will be redesigned to avoid impacts to hairless popcorn flower populations. The changes in design will be approved by a qualified biologist to insure that no impacts to the population will occur. If avoidance is not possible, additional environmental review and development of site specific mitigation measures will be required.

7.2.5 Operational Impacts to Steelhead and Monterey Roach from Development or Redevelopment of High Quality Local Surface Water Supplies

7.2.5.1 Avoidance and Minimization

Prior to approval of a surface water diversion project by the Lead Agency, minimum flow requirements in Pacheco Creek, Arroyo De Las Viboras, and Arroyo Dos Picachos during critical winter and late spring periods will be established. Diversions will be designed so that they will not cause interference with steelhead migration or Monterey roach survival in Pacheco Creek or Arroyo Dos Picachos. The ability of the creek channels to convey modified flows with minimal scour or deposition will also be assessed.

Minimum flow requirements will be reviewed by appropriate state and federal water and resources agencies, including the State Water Resources Control Board, the California Department of Fish and Game, and National Marine Fisheries Service.

7.2.6 Construction Impacts to Steelhead

Steelhead could occur in the San Benito River, Pacheco Creek, and any other unobstructed tributary of the Pajaro River. Construction activities that will occur in stream habitat (e.g. those involving diversion structures) could directly impact steelhead. If channel diversions occur, steelhead could become stranded, and activities in channels could result in direct take of individuals. In addition, construction activities could result in degradation of water quality (e.g. through leaching cement altering stream pH or increasing sedimentation).

7.2.6.1 Construction Scheduling and Work in Channels Where Water is Present.

Construction in tributaries of the Pajaro River will be limited to the dry season (June 1 to October 31), when steelhead are least likely to be present. Most of the San Benito River and other tributaries are typically dry during this time period. If construction will occur in a live, flowing, stream channel, National Marine Fisheries Service (NMFS) will be consulted regarding measures necessary to prevent take. Because it is possible that juveniles could be moving downstream during any time of year, including the dry season, these measures should ensure that movement of steelhead is not prevented by any water diversion structures used during construction, regardless of when construction occurs. Ideally, the live stream channel will be maintained and protected (e.g. by a structure covering the channel, and coffer dams around construction areas). If the live channel cannot be maintained, water would be diverted through construction sites by way of an open ditch (rather than a pipe) connecting the portions of the channel immediately upstream and downstream from the site. This plastic-lined ditch should also be lined with cobble-sized stones to deter predation by making the steelhead less conspicuous as they pass through the channel. Water within this ditch should be at least 30 centimeters (12 inches) deep, and no impediments to movement, such as high drop structures, will be present.

7.2.6.2 Implement Hazardous Materials Spill Prevention and Best Management Practices.

A hazardous material spill prevention plan will be developed and implemented for any work in or adjacent to the Pajaro River or its tributaries. Hazardous materials will be stored in secured structures with secondary spill containment features. Refueling of construction equipment and vehicles will not occur within 300 feet of any water body or anywhere that spilled fuel could drain to a water body. The contractors will check and maintain equipment and vehicles daily to prevent leaks of fuels, lubricants, or other fluids. The implementation of Best Management Practices (see *Implementation of Best Management Practices for Work in Stream Channels*, above) will also be required.

7.2.6.3 Reduce Barriers to Movement.

The placement of diversion structures or other hardscape within and immediately adjacent to the low flow channel of any tributary could cause an impediment to migration for steelhead. Potential in-stream structures will be designed in such a way as to not encroach upon the low flow channel and be designed to avoid hardscape that could result in significant eddies within the low flow channel.

7.2.6.4 Consultation with National Marine Fisheries Service

Consultation with National Marine Fisheries Service will be completed for any new project activities that could affect steelhead such as dewatering creeks or rivers, or any in-stream construction.

7.2.7 Construction Impacts to Red-legged Frogs and Other Aquatic Species

7.2.7.1 Avoidance.

To the greatest extent feasible, construction of project elements will be planned to avoid habitat for aquatic species such as the red-legged frog. If construction will occur adjacent to habitat for aquatic species, impacts will be avoided through the following measures.

a. Prior to any construction activities, the boundaries of construction areas will be clearly delineated with orange plastic construction fencing to prevent workers or equipment from inadvertently straying from the construction area. All construction personnel, equipment, and vehicle movement shall be confined to designated construction areas and connecting roadways. Movement of construction and personal vehicles shall be prohibited outside designated construction areas or off established roadways.

b. Prior to the onset of any ground disturbing activities, exclusion fencing will be established around areas of potentially occupied habitat, as determined by a qualified biologist. Exclusion fencing will consist of silt-fencing or similar material at least 36 inches in height that is buried six inches in the ground to prevent incursion under the fence. Exclusion fencing may be installed at the base of the construction fencing described in A above. This fence will be surveyed each morning before construction, to verify that no frogs have entered the construction site.

c. Before any construction activities begin, a U.S. Fish and Wildlife Service approved biologist will conduct a training session with construction personnel to describe the California red-legged frog and its habitat, the specific measures being implemented to minimize effects to the species, and the boundaries of the construction area.

d. All food-related trash items will be enclosed in sealed containers and removed daily from a project site to discourage the concentration of potential predators in habitat potentially occupied by California red-legged frogs.

7.2.7.2 Implement Hazardous Materials Spill Prevention and Best Management Practices.

See *Implement Hazardous Material Spill Prevention and Implementation of Best Management Practices For Work in Stream Channels,* above)

7.2.7.3 Consultation with the USFWS

Take of California red-legged frogs is only permitted through consultation with the USFWS. Some project elements may involve a federal nexus and, therefore, Section 7 consultation will be required. Other project elements will lack a federal nexus, however, and take will only be authorized upon approval of a suitable Habitat Conservation Plan (HCP). The HCP will provide specific mitigation measures appropriate to the scale of take. Depending on the construction activities, these mitigation measures could range from presence of an on-site monitor to extensive habitat restoration. An HCP would be completed though consultation with the USFWS.

7.2.8 Construction Impacts to San Joaquin Kit Fox

7.2.8.1 Take Avoidance

Standard take-avoidance measures listed on the following pages will be implemented to avoid direct take of any individual kit fox that may wander onto the project site. To avoid direct take of any individual kit fox that may be present on a project site, preactivity surveys will be conducted if any habitat feature with the potential to be used by kit foxes (i.e. burrows, irrigation pipes, debris piles) is created or placed on site and is to be subsequently disturbed or moved. If kit foxes are detected, work in that area must cease and consultation with the USFWS is necessary to determine the appropriate course of action.

STANDARD RECOMMENDATIONS PUT FORTH BY UNITED STATES FISH AND WILDLIFE SERVICE FOR THE PROTECTION OF SAN JOAQUIN KIT FOX PRIOR TO OR DURING GROUND DISTURBANCE. 28 JUNE 1999.

Construction and Operational Requirements

Habitat subject to permanent and temporary construction disturbances and other types of project-related disturbances should be minimized. Project designs should limit or cluster permanent project features to the smallest area possible while still permitting project goals to be achieved. To minimize temporary disturbances, all project-related vehicle traffic should be restricted to established roads, construction areas, and other designated areas. These areas should also be included in preconstruction surveys and, to the extent possible, should be established in locations disturbed by previous activities to prevent further impacts.

1. Project-related vehicles should observe a 20-mph speed limit in all project areas, except on county roads and State and Federal highways; this is particularly important at night when kit foxes are most active. To the extent possible, night-time construction should be minimized. Off-road traffic outside of designated project areas should be prohibited.

STANDARD RECOMMENDATIONS PUT FORTH BY UNITED STATES FISH AND WILDLIFE SERVICE FOR THE PROTECTION OF SAN JOAQUIN KIT FOX PRIOR TO OR DURING GROUND DISTURBANCE. 28 JUNE 1999.

2. To prevent inadvertent entrapment of kit foxes or other animals during the construction phase of a project, all excavated, steep-walled holes or trenches more than 2 feet deep should be covered at the close of each working day by plywood or similar materials, or provided with one or more escape ramps constructed of earth fill or wooden planks. Before such holes or trenches are filled, they should be thoroughly inspected for trapped animals. If at any time a trapped or injured kit fox is discovered, the procedures under number 13 of this section must be followed.

3. Kit foxes are attracted to den-like structures such as pipes and may enter stored pipe becoming trapped or injured. All construction pipes, culverts, or similar structures with a diameter of 4-inches or greater that are stored at a construction site for one or more overnight periods should be thoroughly inspected for kit foxes before the pipe is subsequently buried, capped, or otherwise used or moved in any way. If a kit fox is discovered inside a pipe, that section of pipe should not be moved until the Service has been consulted. If necessary, and under the direct supervision of the biologist, the pipe may be moved once to remove it from the path of construction activity, until the fox has escaped.

4. All food-related trash items such as wrappers, cans, bottles, and food scraps should be disposed of in closed containers and removed at least once a week from a construction or project site.

5. No firearms shall be allowed on the project site.

6. To prevent harassment, morality of kit foxes or destruction of dens by dogs or cats, no pets should be permitted on project sites.

7. Use of rodenticides and herbicides in project areas should be restricted. This is necessary to prevent primary or secondary poisoning of kit foxes and the depletion of prey populations on which they depend. All uses of such compounds should observe label and other restrictions mandated by the U.S. Environmental Protection Agency, California Department of Food and Agriculture, and other State and Federal legislation, as well as additional project-related restrictions deemed necessary by the Service. If rodent control must be conducted, zinc phosphate should be used because of proven lower risk to kit fox.

8. A representative shall be appointed by the project proponent who will be the contact source for any employee or contractor who might inadvertently kill or injure a kit fox or who finds a dead, injured or entrapped individual. The representative will be identified during the employee education program. The representative's name and telephone number shall be provided to the Service.

STANDARD RECOMMENDATIONS PUT FORTH BY UNITED STATES FISH AND WILDLIFE SERVICE FOR THE PROTECTION OF SAN JOAQUIN KIT FOX PRIOR TO OR DURING GROUND DISTURBANCE. 28 JUNE 1999.

9. An employee education program should be conducted for any project that has expected impacts to kit fox or other endangered species. The program should consist of a brief presentation by persons knowledgeable in kit fox biology and legislative protection to explain endangered species concerns to contractors, their employees, and military and agency personnel involved in the project. The program should include the following: a description of the San Joaquin kit fox and its habitat needs; a report of the occurrence of kit fox in the project area; and explanation of the status of the species and its protection under the Endangered Species Act; and a list of measures being taken to reduce impacts to the species during project construction and implementation. A fact sheet conveying this information should be prepared for distribution to the above-mentioned people and anyone else who may enter the project site.

10. Upon completion of the project, all areas subject to temporary ground disturbances, including storage and staging areas, temporary roads, pipeline corridors, etc. should be re-contoured if necessary, and revegetated to promote restoration of the area to pre-project conditions. An area subject of "temporary" disturbance means any area that is disturbed during the project, but that after project completion will not be subject to further disturbance and has the potential to be revegetated. Appropriate methods and plant species used to revegetate such areas should be determined on a site-specific basis in consultation with the Service, California Department of Fish and Game (CDFG), and revegetation experts.

11. In the case of trapped animals, escape ramps or structures should be installed immediately to allow the animal(s) to escape, or the Service should be contacted for advice.

12. Any contractor, employee, or military or agency personnel who inadvertently kills or injures a San Joaquin kit fox shall immediately report the incident to their representative. This representative shall contact the CDFG immediately in case of a dead, injured or entrapped kit fox. The CDFG contact for immediate assistance is State Dispatch at (916) 445-0045. They will contact the local warden or biologist.

    The Sacramento Fish and Wildlife Office and CDFG will be notified in writing within three working days of the accidental death or injury to a San Joaquin kit fox during project related activities. Notification must include the date, time, and location of the incident or of the finding of a dead or injured animal and any other pertinent information. The Service contact is the Chief of the Division of Endangered Species, at the addresses and telephone numbers given below. The CDFG contact is Mr. Ron Schlorff as 1416-9th Street, Sacramento,

STANDARD RECOMMENDATIONS PUT FORTH BY UNITED STATES FISH AND WILDLIFE SERVICE FOR THE PROTECTION OF SAN JOAQUIN KIT FOX PRIOR TO OR DURING GROUND DISTURBANCE. 28 JUNE 1999.
California, (916) 654-4262.

7.2.9 Potential Construction Impacts to Vernal Pool Fairy Shrimp

Vernal pool fairy shrimp are reported to occur in San Benito County. Any construction that would directly impact vernal marsh habitat (including construction during the dry season) could negatively impact this species.

7.2.9.1 Avoid Habitat.

New projects should be designed, constructed, and operated in such a way as to avoid and/or minimize impacts to vernal marsh habitat. If construction is planned adjacent to vernal marsh habitat, prior to any construction activities, the boundaries of construction areas will be clearly delineated with orange plastic construction fencing to prevent workers or equipment from inadvertently straying from the construction area.

7.2.9.2 Protect Water Quality.

Refer to *Implement Hazardous Materials Spill Prevention,* above.

7.2.10 Construction Impacts to California Tiger Salamanders and Their Habitat

California tiger salamanders could occur in aquatic habitats, and in grassland and oak woodland habitats near aquatic habitat (including vernal marshes) in San Benito County. Construction activities in these habitats could impact California tiger salamanders. The following mitigation measures will reduce impacts to California tiger salamanders and their habitat to less-than-significant levels.

7.2.10.1 Determine Presence/Absence

Prior to construction, protocol-level surveys for California tiger salamanders will be conducted by a qualified biologist in any potential habitat for the species that could be affected by the Management Plan.

7.2.10.2 Avoidance.

Project elements that will impact California tiger salamanders or their habitat will be redesigned to avoid all impacts. If avoidance is not possible, then *Compensation for Habitat Loss* and consultation with CDFG will be necessary.

7.2.10.3 Compensation for Habitat Loss

Replacement of aquatic, wetland, and/or upland habitat that provides breeding or aestivation habitat for California tiger salamanders will provided commensurate with project impacts. Restoration of areas of temporary impacts will replace amphibian habitat impacted temporarily. Mitigation ratios to compensate for permanent impacts to aquatic, wetland and upland habitat must provide more than the existing breeding, foraging and aestivation habitat at the impact site and will be approved by CDFG.

7.2.11 Construction Impacts to Burrowing Owls and Burrowing Owl Habitat

Raptors, including owls, and their nests are protected under both federal and state laws, including the Migratory Bird Treaty Act and California Fish and Game Code section 3503.5. Burrowing Owls could occur in grassland habitat and margins of agricultural areas where ground squirrels are present. Construction-related disturbance during the breeding season could result in the incidental loss of fertile eggs or nestlings or otherwise lead to nest abandonment. Disturbance that causes nest abandonment and/or loss of reproductive effort is considered take by CDFG.

For projects in grassland habitat that could result in permanently displacement of burrowing owls (i.e., installation of evaporation ponds, constructed wetlands, or percolation ponds), protocol burrowing owl surveys will be conducted between April 15 and July 25. If burrowing owls are observed during surveys, the extent of burrowing owl habitat on the site will be delineated by a qualified ornithologist. Avoidance and/or habitat mitigation measures will be incorporated in future projects, as appropriate.

7.2.11.1 Avoidance

Preconstruction surveys for Burrowing Owls will be completed in conformance with CDFG protocols, no more than 30 days prior to the start of construction in grassland habitat and margins of agricultural areas where habitat for Burrowing Owls is present. If no Burrowing Owls were located during these surveys, no additional action would be warranted. However, if breeding or resident owls were located on, or immediately adjacent to, the site, the project could be reconfigured to avoid impacts or buffer zones will be established and/or resident owls will be relocated, as described below. For projects that would permanently displace burrowing owl populations, habitat replacement could be required.

7.2.11.2 Buffer Zones

A 250-foot buffer, within which no new activity will be permissible, will be maintained between project activities and any nesting Burrowing Owls. This protected area will remain in effect until August 31, or at the CDFG's discretion and based upon monitoring evidence, until the young owls are foraging independently.

7.2.11.3 Relocation

If construction will directly impact occupied burrows, eviction outside the nesting season may be permitted pending evaluation of eviction plans and receipt of formal written approval from the CDFG authorizing the eviction. No burrowing owls will be evicted from burrows during the nesting season (February 1 through August 31).

7.2.11.4 Habitat Replacement

For projects that would permanently impact occupied, burrowing owl habitat, habitat replacement may be required as part of a habitat mitigation plan and mitigation agreement with the California Department of Fish and Game. Habitat replacement could include protection of the habitat replacement area in perpetuity by a conservation easement or fee

title acquisition. Burrowing owl replacement habitat (for projects in northern San Benito County) should be identified within the northern San Benito County or southern Santa Clara County area.

7.2.12 Construction Impacts to Large Nesting Colonies of Tricolored Blackbirds

Large Tricolored Blackbirds nesting colonies are present in wetland habitats in northern San Benito County. This species could be impacted by construction activities during the nesting season (March 1 to July 1). Construction close to active colonies could result in desertion of nests.

7.2.12.1 Preconstruction Surveys and Avoidance

Prior to construction during the breeding season (March 1 to July 1) within 250 feet of potential nesting habitat for Tricolored Blackbirds (wetland habitat with tall vegetation nearby), preconstruction surveys will be conducted. If Tricolored Blackbirds are present, construction will be delayed until after the breeding season.

7.2.13 Tree Belt Plantings

7.2.13.1 Avoidance

Invasive, exotic tree species will not be used in tree belt plantings. Examples of invasive species include tree of heaven (*Ailanthus altissima*) and blue gum (*Eucalyptus globulus*). Tree selections will be made in consultation with the County of San Benito Agricultural Commissioner.

7.2.13.2 Consideration of Native Tree Species for Tree Belt Plantings

As a part of site specific planning, the use of tree species native to the project vicinity will be considered and compared with the water-removing capacity of other suitable species. If native trees are used, they should be propagated from trees in the local area.

7.2.14 Groundwater Pumping for Water Level Management

7.2.14.1 Determination of Groundwater Conditions and Presence/Absence of Wetland Habitats Within the Zone of Influence

Prior to initiating a groundwater pumping program, an evaluation that includes the following information and analyses, at minimum, would be prepared.

a. Identification of the physical location of the groundwater level management area.

b. Identification of the quantity and timing of proposed groundwater pumping and resulting changes in groundwater levels and flows to creeks.

c. Proposed disposal/disposition of pumped groundwater.

d. Identification of existing wetland, aquatic and riparian habitats within the groundwater level management area and within the zone of influence of proposed pumping.

e. Identification of potential areas of wetland, aquatic and riparian habitats that could be impacted by proposed groundwater pumping.

f. Identification of the water quality of pumped groundwater, including general mineral constituents (major anions and cations), TDS, nitrate, pesticides and other organic compounds, inorganic persistent and bioaccumulative toxic substances (including boron and some metals) pH, and temperature.

g. Identification of any special status species populations, such as steelhead, Monterey roach, red-legged frog or California tiger salamanders, that occupy standing water, wetlands or aquatic habitats within the groundwater level management area and within the zone of influence of the proposed pumping.

7.2.14.2 Avoidance and Minimization of Potential Impacts to Wetland, Aquatic and Riparian Habitats

Groundwater Pumping Programs will conform to the following conditions:

a. Planned reductions in groundwater levels will only impact developed habitats; or

b. Impacts to wetland, aquatic and riparian habitats are relatively small (less than one acre) and would be off-set by habitat replacement in the immediate vicinity of the impact; and

c. The pumping activity will be designed to avoid impacts to special-status species dependent on wetland, aquatic or riparian habitats (*e.g.,* steelhead, Monterey roach, red-legged frog or California tiger salamanders) or these impacts are mitigated, such as through the implementation of an approved Habitat Conservation Plan.

d. The pumping activity will be designed to avoid substantial water quality impacts to aquatic and riparian habitats including, but not limited to, adverse effects on dissolved oxygen, nitrate, or bioaccumulative toxic substance concentrations.

7.2.15 Constructed Wetlands

A water quality and wildlife monitoring program will be established and implemented for new constructed wetlands designed to treat or polish agricultural and/or storm water runoff. Prior to construction, a baseline survey for special status species populations will be conducted on the site. Annual surveys, at the appropriate times of year, will be conducted by a qualified biologist for the first five years of operation. The surveys will address, at minimum, observed changes in population and use of the constructed wetlands by special status species and any management recommendations. Management of the constructed wetlands will be adapted to avoid identified impacts to wildlife using the constructed wetlands.

Water quality of constructed wetlands will be assessed as described under *Water Quality of Constructed Wetlands.*

7.3 Construction Impacts

7.3.1 Dust Abatement Program

For new projects that exceed the threshold limits established by the Monterey Bay Unified Air Pollution Control District (currently 2.2 acres of disturbance, or 82 lb/day), a dust abatement program will be implemented in accordance with Air Pollution Control District requirements.

7.3.2 Noise Control of Construction Equipment

Construction equipment will be adequately muffled and maintained. Construction near sensitive noise receptors, such as residences, schools, medical facilities, libraries, churches, day care centers, and convalescent homes will be limited to weekdays (Monday-Friday) during daylight hours, between 7 A.M. and 6 P.M., except under emergency conditions.

7.3.3 Permitting of Well Drilling Operations

Well drilling operations will obtain necessary well permits and conform to specifications that include, at minimum, proper disposal of drilling fluids, proper disposal and/or treatment of water produced during well development and pumping tests, and site clean-up at the end of the project.

7.4 Cultural Resources

7.4.1 Project Site-Specific Archive and Literature Search

A site-specific archive and literature search would be conducted for project sites once they have been selected for construction. An archaeological and architectural field inventory of areas not previous surveyed would also be completed. Appropriate recordation or supplements to existing documentation would be placed on file with the California Historical Resources Information System, Northwest Information Center at California State University Sonoma, Rohnert Park.

7.4.2 Implementation of Measures to Avoid or Reduce Impacts

For cultural resources identified as eligible for the National Register of Historic Places/California Register of Historical Resources, measures to avoid or reduce impacts to a less-than-significant level would be implemented. Preferred mitigation is avoidance of areas of recorded or known significant or potentially significant cultural resources. Mitigation measures would include:

- Mitigation monitoring by a Professional Archaeologist of archaeologically sensitive areas during ground disturbing construction;
- Formal training of construction personnel to recognize, report and avoid cultural resources;
- The flagging and/or fencing of recorded cultural resources within 100 feet of a project for avoidance and protection;
- Construction contract language discussing the potential for significant subsurface archaeological resources and protocols for dealing with unexpected discoveries; and,
- The requirements for the identification, evaluation and treatment of significant unexpected discoveries in accordance with regulatory requirements.

7.4.3 Notification If Significant Cultural Materials Are Encountered

In the event any significant cultural materials are encountered, all construction within a radius of 100 feet of the find would be halted, the District Manager of the San Benito County Water District and appropriate City or County Planning Department personnel would be notified, and the archaeologist will examine the find and make appropriate recommendations regarding the significance of the find and the appropriate mitigation. Recommendations could include collection, recordation, and analysis of any significant cultural materials.

7.4.4 Notification if Human Skeletal Remains Are Encountered

In the event that human skeletal remains are encountered, the County Coroner will be notified immediately. Upon determination by the County Coroner that the remains are Native American, the coroner shall contact the California Native American Heritage Commission, pursuant to subdivision (c) of section 7050.5 of the Health and Safety Code and the County Coordinator of Indian Affairs. No further disturbance of the site may be made except as authorized by the County Coordinator of Indian Affairs in accordance with the provisions of State law and the Health and Safety Code. The District Manager of the San Benito County Water District and appropriate City or County Planning Department personnel will also be notified immediately, as appropriate, if human skeletal remains are found during development.

7.5 Energy

7.5.1 Energy Efficiency and Water Conservation

Energy and water conservation techniques and energy efficiency will be incorporated in all new building and equipment design and procurement, orientation and construction.

7.6 Geology and Seismicity

7.6.1 Design-Level Geotechnical Study And/Or Soil Foundation Report

A design-level geotechnical study and/or soil foundation report will be completed to develop specific design criteria for new projects that include the installation of structures, foundations, pipelines, or levees. Geotechnical studies will include site-specific evaluations of soil conditions, fault creep, ground shaking and the potential for liquefaction and lateral spreading. Mitigation measures to reduce geologic and seismic hazards to an acceptable level of risk will be included in new projects.

7.6.2 Post-Seismic Event Functionality for Critical Facilities

Critical facilities, such as water and wastewater treatment facilities and domestic water lines, will be designed and located in a manner that maximizes their ability to remain functional after a major earthquake.

7.6.3 Erosion Control Measures

Measures to minimize erosion, including grading during the dry season and reseeding of disturbed areas, will be incorporated in new water management or water treatment projects that require grading and/or tree removal. Erosion and sedimentation control practices are listed in Program Mitigation Measure 7.7.3.1 under *Hydrology and Water Quality.*

7.7 Hydrology and Water Quality

7.7.1 Flooding Impacts

7.7.1.1 Conformance to FEMA Flood Program Requirements and Local Floodplain Ordinance

At a minimum, all proposed GWMP facilities will conform will conform to FEMA Flood Program requirements and the appropriate local floodplain ordinance. Pipelines shall be buried, with excess spoils disposed of outside of the 100-year floodplain and pump stations shall be sited outside of the floodplain.

7.7.1.2 Flood analysis

A flood analysis will be completed as a part of the design of any constructed wetlands or other project elements located within the 100-year floodplain. The flood analysis will address, at minimum, flood conveyance, potential increases in flood elevation, and any impacts to neighboring properties. Measures to avoid flooding impacts will be included in the final design

of project elements. Berm heights of constructed wetlands or other facilities shall be sufficient to provide adequate freeboard above the 100-year flood event, and the outside surface of the berms shall be covered with riprap or other material to prevent erosion during peak flow events.

7.7.1.3 Avoidance

Groundwater pumping programs for groundwater level management will suspend discharge to the Pajaro River, the San Benito River, or their tributaries when high water and near flooding conditions are present locally or in the Pajaro Valley.

7.7.2 Surface Water and Groundwater Hydrology

7.7.2.1 Avoidance and Minimization

Refer to *Operational Impacts to Steelhead from Development or Redevelopment of High Quality Local Surface Water Supplies*, above.

7.7.3 In-Basin Water Banking

7.7.3.1 Aquifer Storage and Recovery

Treatment in accordance with the State of California's Surface Water Treatment Regulation will be implemented prior to injection or following recovery of surface water before any domestic use of that water occurs.

7.7.3.2 Groundwater Levels

Groundwater level increases from In-Basin Water Banking, including operation of aquifer storage and recovery wells, will not be allowed within 30 feet of the ground surface, or levels that could impact the operation of septic wastewater disposal systems.

7.7.4 Impacts to Water Quality from Evaporation and Trucking of Salts

7.7.4.1 Avoidance

An impermeable barrier, that will prevent saline water from percolating into the groundwater, will be provided beneath any evaporation ponds for concentrate from groundwater demineralization or treatment.

Adequate freeboard to contain a 100-year storm event and drainage will be provided in evaporation ponds to prevent runoff from reaching surface waters.

7.7.5 Construction Impacts

7.7.5.1 Construction BMPs

Contractors shall be required to implement Best Management Practices (BMPs) for construction activities. The BMPs include measures guiding the management and operation of construction sites to control and minimize the potential contribution of pollutants to storm runoff from these areas. These measures address procedures for controlling erosion and sedimentation and managing all aspects of the construction process to ensure control of potential water pollution sources. Erosion and sedimentation control practices typically include:

- limiting construction to the dry-weather months;
- installation of silt fencing and/or straw wattle;
- soils stabilization;
- revegetation; and
- runoff control to limit increases in sediment in storm water runoff (e.g., straw bales, silt fences, check dams, geofabrics, drainage swales, and sand bag dikes).

7.7.5.2 Restriction On Stream Channel Construction Scheduling

Construction activities within stream channels (i.e., diversion structures on local streams) shall be confined to the dry, summer season in order to minimize adverse impacts to local water quality.

7.7.6 Water Conservation

7.7.6.1 Promote Water Conservation

Promote water conservation through public education and encouraging use of drought tolerant landscaping and water-saving appliances and irrigation techniques, as described in the current Hollister Area Urban Water Management Plan and San Benito County Water Conservation Plan.

7.7.7 Water Quality of Constructed Wetlands

7.7.7.1 Characterization of Water to Be Treated/Polished

As part of the design process for constructed wetlands, the following water quality and environmental characteristics will be addressed:

a. Potential impacts on receiving waters. The potential impacts to receiving surface water and groundwater will be assessed based upon the projected quality and quantity of water to be discharged from the constructed wetlands and the existing and projected quality of receiving waters. Conformance with Central Coast Regional Water Quality Control Board discharge requirements and the Central Coast Basin Water Quality Control Plan surface water quality objectives will be required.

b. Water quality and quantity of the subject water. The quality of the agricultural drainage waters to be treated in constructed wetlands will be assessed as a part of the wetland design process. Constituents to be assessed include, but are not limited to, general mineral constituents (major anions and cations), TDS, nitrate, pesticides and other organic compounds, and inorganic persistent and bioaccumulative toxic substances, including boron and some metals.

c. Water quality and quantity of water to be discharged from the constructed wetland(s) The level of treatment or polishing will be estimated based upon the proposed configuration of the ponds, detention time of water prior to discharge, the amount of water in the wetland system, and proposed plant species in the wetlands.

7.7.7.2 Water Quality Monitoring of Constructed Wetlands

Water quality in constructed wetlands (including, but not limited to salinity, pesticides, and metals) will be monitored as required by the Central Coast Regional Water Quality Control Board. Results of water quality analyses will be provided to the California Department of Fish and Game upon request.

7.8 Land Use (Agricultural Resources and Airport Safety)

7.8.1 Site/Project Design to Minimize Impacts to Prime Farmland and Farmland of Statewide Importance

Site and project design will be used to minimize direct and indirect impacts to Prime Farmland and Farmland of Statewide Importance. Large ponds or facilities for evaporation of concentrate from groundwater treatment will not be sited on Prime Farmland or Farmland of Statewide Importance. Constructed wetlands for polishing of agricultural drainage or storm water and tree belt plantings will be sited to avoid substantial impacts to Prime Farmland or Farmland of Statewide Importance. A substantial impact would be a net impact to 10 acres or more.

Potential land use conflicts with agricultural operations from new project elements, such as modifying access to fields for farm equipment or reducing necessary land use buffers, will be avoided.

7.8.2 Site/Project Design to Avoid Aviation Safety Impacts

Proposed new or expanded wastewater treatment facilities, constructed wetlands and other uses that have the potential to attract wildlife potentially hazardous to aircraft in the vicinity of the Hollister Municipal Airport will consult with the FAA and the San Benito County Airport Land Use Commission to ensure that the facility will be compatible with existing, as well as future, airport operations.

7.9 Noise and Land Use Compatibility

7.9.1 Minimize Nuisance of Noise Generating Equipment

Noise generating equipment, such as pumps and compressors, will be designed to avoid causing a nuisance or disturbance to nearby sensitive receptors, defined as residences, schools, medical facilities, libraries, churches, day care centers, and convalescent homes.

Noise levels at the property line will conform to the following guidelines, developed from federal and state standards:

Noise Standards for Noise Generating Equipment Hourly Equivalent (Leq)		
	Noise Level in Decibels at Property Line	
	7 AM - 7 PM	**7 PM - 7 AM**
Noise generating equipment adjacent to or effecting a property used or zoned for residential or other defined sensitive purposes	60	50
Noise generating equipment adjacent to a property used or zoned for commercial purposes	65	65
Noise generating equipment adjacent to a property used or zoned for industrial or other than commercial or residential purposes or defined sensitive uses.	75	75

dBA = decibels, A-weighted scale

In addition, future projects with noise generating equipment will be sited and designed so that noise levels, using the 24-hour Day-Night Level (DNL) descriptor, will not exceed 60 dBA DNL in outdoor activity areas for noise sensitive uses. Noise levels will be reduced by incorporating noise reduction technology (acoustical treatments) such as acoustical enclosures and mufflers.

7.9.2 Noise Analysis for Existing and Future Conditions Near Noise Sensitive Receptors

A noise analysis that addresses existing and future conditions will be completed by a qualified acoustical consultant prior to the approval of noise generating projects located in the vicinity of noise sensitive receptors. The noise analysis will identify measures required to conform with the noise guidelines listed in Program Mitigation Measure 7.9.1.

7.10 Visual and Aesthetic Resources

7.10.1 Design of New Projects for Compatibility With Nearby Development

New projects will be designed to be compatible with the mass and scale of nearby development. Structures, such as water treatment facilities, will incorporate design features that reflect the character of nearby development.

7.10.2 Avoid Blocking View on Designated Scenic Roadways/Highways

New projects will be designed to avoid blocking views from State of California designated scenic roadways or highway corridors.

7.10.3 Avoid Substantial Alteration of View on Designated Scenic Roadways/Highways

New percolation ponds, evaporation ponds, and emergency storage facilities will be designed and sited to avoid substantially altering views from State of California designated scenic roadways or highway corridors. Landscaping and berms will be used to limit views of evaporation ponds.

7.10.4 Avoid Substantial New Light/Glare on Surrounding Land Uses

Lighting and building materials at new facilities will be designed to avoid the generation of substantial new light or glare on surrounding land uses.

Section 8: Water Management Strategies and Project Elements for Future Study

In addition to the project elements previously discussed in this management plan, there are several water management issues and possible projects that warrant study in the future.

Although not currently at a critical level, the buildup of salts in the groundwater basin is of concern in the long-term. Almost all agricultural, domestic and municipal and industrial uses increase water salinity. Crop evapotranspiration concentrates salts, and various forms of salt inputs (i.e., fertilization, infiltration of treated wastewater) increase the salinity of groundwater. In addition, salts are transported into the basin with CVP surface water and groundwater outflow from the basin is limited by the hydrogeologic characteristics of the groundwater basin. Several of the water quality management strategies and projects identified for further study address concerns regarding long-term salt buildup in the groundwater basin.

The strategies and projects described in this section are not currently included as management tools in the GWP Update but may be studied in the future. Inclusion of the Out-of-Basin Export projects outlined below in the GMP Update and their implementation below would require appropriate environmental review.

8.1 Out-of-Basin Export

One broad area for future study is the Out-of-Basin Export of wastewater effluent, groundwater treatment concentrate, agricultural drainage runoff, and/or pumped groundwater for salt management. Two different options for Out-of-Basin Export that have been identified for further study are: discharge to the San Benito River or Pajaro River; and an export pipeline to the City of Watsonville's ocean outfall.

8.1.1 River Discharge

Several waste streams could discharge to either the San Benito River or Pajaro River as part of a water quality management program for the groundwater basin. Exporting water containing various concentrations of salts from the groundwater basin in San Benito County to downstream surface waters and groundwater in the Pajaro Valley could have a range of beneficial and adverse effects. Future study of this option will need to address and model, at a minimum, the following water quality and environmental characteristics:

- water quality and quantity of the subject water to be discharged (wastewater effluent, groundwater treatment concentrate, agricultural drainage runoff, and/or pumped groundwater) including general mineral constituents (major anions and cations), nitrate, boron, pesticides, and metals (inorganic persistent and bioaccumulative toxic substances).

- water quality and flows in the Pajaro River and the effect of implementation of River Discharge on downstream surface water and groundwater.
- the potential for pharmaceutical residues from wastewater to be introduced into surface water, groundwater or Monterey Bay.
- the potential for trihalomethane in wastewater effluent streams from water treatment.
- thermal effects of river discharge.
- potential impacts from river discharge on downstream flooding, salt balance in the Pajaro Valley, breaching of the sand bar at the mouth of Pajaro River, steelhead, tidewater goby, and other special status species populations, and water quality and wildlife populations in the Pajaro River and Pajaro River Lagoon.
- potential impacts to Prime Farmland and agricultural resources in the Pajaro Valley, including potential impacts on agricultural productivity from increased salinity.
- conformance with Central Coast Regional Water Quality Control Board discharge requirements and the Central Coast Basin Water Quality Control Plan surface water quality objectives.
- options for storing water when discharge to the river was prohibited or otherwise limited would also need to be identified and the environmental effects of water storage evaluated.

The Pajaro River has been identified as an impaired water body for nutrients, sediments, and fecal coliform by the Regional Water Quality Control Board and is therefore undergoing a process to collect data and meet with stakeholders to establish a Total Mass Daily Loading (TMDL) for the parameters of concern. This data, and possibly additional data for the purpose of assessing potential impacts on the Pajaro River and groundwater basin, could be used to assess impacts of any future River Discharge project element.

8.1.2 Export Pipeline

An export pipeline could be routed from Hollister or the San Juan Valley to the City of Watsonville's ocean outfall. Like River Discharge, this possible project element would require extensive modeling of the water quality and quantity of water to be discharged. Conformance with the discharge permit requirements of the Watsonville ocean outfall and alternative methods for disposing or storing water in the event the ocean outfall was temporarily unavailable for use would need to be thoroughly investigated along with the potential impacts to the water quality of Monterey Bay.

Potential avoidance and mitigation measures for impacts to biological resources, including direct impacts to riparian habitat at creek crossings, and potential seismic hazards are potential areas of study for any future pipeline routes. Construction of a new pipeline to Watsonville will require a number of creek crossings and could impact areas of sensitive habitat. The pipeline would also cross several earthquake faults to the west of the San Juan Valley.

8.2 Concentrate Disposal Strategy

There are a number of strategies that could be employed to dispose of concentrate from demineralization/desalting processes. Since treatment of groundwater for municipal and industrial use has been identified as a high priority, it would be prudent to better define a number of issues, including: the quantity of concentrate that would require disposal; the availability of methodologies to achieve higher concentrations, thereby reducing the volume to be disposed of; and the current and future costs of disposal.

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